

No. 100

THE GULF AND RIVER ST. LAWRENCE

THIRD EDITION

1908



HYDROGRAPHIC OFFICE



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THE GULF AND RIVER ST. LAWRENCE

THIRD EDITION
1908

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CONTENTS.

	Page.
Note	5
Index chart..... Faces	7
Information relating to navigational aids and general navigation.....	7
Index.....	563
List of Hydrographic Office agents	597
List of Hydrographic Office publications	593

CHAPTER I.

Canada and the eastern maritime provinces, general remarks—Navigation, ice, fogs, winds and weather, currents, tides—Lights, buoys, signal stations, telegraph cables, docks, coal, repairs, pilots—Nova Scotia banks—General directions, St. Lawrence gulf and river.....	27
--	----

CHAPTER II.

Islands in the gulf of St. Lawrence.....	74
--	----

CHAPTER III.

Cape Breton island, west coast and St. George bay.....	110
--	-----

CHAPTER IV.

Northumberland strait, south and west shores, cape George to Miramichi bay.....	138
---	-----

CHAPTER V.

Prince Edward island, Northumberland strait, north shore.....	189
---	-----

CHAPTER VI.

Gulf of St. Lawrence, west coast, Miramichi bay to Gaspé bay.....	245
---	-----

CHAPTER VII.

St. Lawrence river, south shore, cape Gaspé to Green island.....	302
--	-----

CHAPTER VIII.

Remarks on Belle Isle strait—Gulf of St. Lawrence, north coast, Belle Isle strait to cape Whittle.....	325
--	-----

CHAPTER IX.

Gulf of St. Lawrence, north coast, cape Whittle to point des Monts.....	369
---	-----

CHAPTER X.

	Page.
St. Lawrence river, north shore, point des Monts to Saguenay river, and the Saguenay river	414

CHAPTER XI.

St. Lawrence river, Green island and Red islet to South Traverse and Coudres island	438
---	-----

CHAPTER XII.

St. Lawrence river, South, Middle, and North channels to Quebec	465
---	-----

CHAPTER XIII.

St. Lawrence river, Quebec to Montreal	508
--	-----

CHAPTER XIV.

General description of canal, lake, and river navigation above Montreal	547
Meteorological tables	556

NOTE.

This publication, a revision of the second edition, includes the latest available information from all reliable sources; it cancels the previous editions, all supplements, and all Hydrographic Office Notices to Mariners which concern the gulf and river St. Lawrence up to and including No. 26 of 1908.

Mariners are earnestly requested to notify the United States Hydrographic Office, directly or through one of its branch offices, of any new information obtained, or of any errors or omissions discovered in the present edition.

The bearings, courses, and trend of the land are true, and are given to the nearest degree, from 0° to 360° , commencing at the North point, in accordance with the new system recently adopted by the United States Navy. The cardinal and intercardinal points of the compass, when used, are only as names to express the general direction of the winds, currents, etc. Variations, other than those at the heads of chapters, may be obtained from H. O. Chart No. 2406.

The directions of winds refer to the points from which they blow; of currents, the points toward which they set. These directions are also true.

Distances are expressed in nautical miles, the mile being approximately 2,000 yards.

The soundings are referred to mean low water, unless it is otherwise stated.

The latest information as to lights should always be sought in the light lists.

CANADA INDEX TO COAST, SPECIAL, AND HARBOR CHARTS

A number against the name of a place thus, Heron Chan. 2496 indicates the catalogue number of the chart of that place.



St. Lawrence River

Quebec to Pt. St. Antoine	1360
Pt. St. Antoine to Ste. Emelie	1359
Ste. Emelie to Champlain	1358
Champlain to Point du Lac	1357
Point du Lac including St. Peter to Ile aux Raisins	1356
Ile aux Raisins to Ile St. Ours	1355
Ile St. Ours to Cape St. Michel	1354
Cape St. Michel to Montreal	1353
Montreal to Beauharnois Canal	1352
Beauharnois Canal to McKies Pt.	1351
McKies Pt. to Cornwall	1350

U. S. HYDROGRAPHIC OFFICE CHARTS ARE SHOWN IN BLACK.
BRITISH ADMIRALTY CHARTS ARE SHOWN IN RED.

East Coast of United States

Belle Isle to New York	1412
Halifax to Key West	1411
Halifax to New York	941
Buxards Bay to Cape Lookout	942
Cape Hatteras to Cape Canaveral	943
Cape Canaveral to Havana	944
Georges Shoal	217, 218, 219, & 220

INFORMATION RELATING TO NAVIGATIONAL AIDS AND GENERAL NAVIGATION.

THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

The following-named publications are issued by the United States Hydrographic Office as guides to navigation: Charts, Chart Catalogues, Sailing Directions, Light Lists, Tide Tables, Notices to Mariners, Pilot Charts, and Hydrographic Bulletins. Of these, the Notices to Mariners and the Hydrographic Bulletins are free to mariners and others interested in shipping. The Pilot Charts are free to contributors of professional information, but sold to the general public at 10 cents a copy. The other publications of the office are sold under the law at cost price.

The Charts, the Sailing Directions, and the Light Lists are all affected by continual changes and alterations, concerning which information is published weekly to all parts of the world in the Notices to Mariners.

The Charts should always be, so far as our knowledge permits, absolutely correct to date; and the Light Lists should be noted for the recent alterations and additions. The Sailing Directions, however, can not, from their nature, be so fully corrected, and in all cases where they differ from the charts, the charts must be taken as the guide.

Charts.—When issued from the Hydrographic Office, the charts have received all necessary corrections to date.

All small but important corrections that can be made by hand are given in the Notices to Mariners, and should at once be placed on the charts to which they refer.

Extensive corrections that can not be conveniently thus made are put upon the plates, and new copies are issued to the ships to replace the old, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which extensive corrections are made are noted on the chart on the right of the middle of the lower edge; those of the smaller corrections at the left lower corner.

In all cases of quotations of charts these dates of corrections should be given, as well as the number of the chart (found in the right lower corner), in order that the edition of the chart referred to may be known.

The Light Lists are corrected before issue, and all changes are published in the weekly Notices to Mariners.

The navigating officer should make notations in the Light Lists and paste in at the appropriate places slips from the Notices to Mariners.

The Light Lists should always be consulted as to the details of a light, as the description in the Sailing Directions may be obsolete, in consequence of changes since publication.

The Sailing Directions are corrected before issue, and subsequently should be kept corrected by means of the Notices to Mariners.

Supplements are published from time to time and contain all the information received up to date since the publication of the volume to which they refer, canceling all previous Notices to Mariners.

The existence of Supplements or Notices to Mariners is to be noted in the tabular form inside the cover of each volume.

To enable the books to be more conveniently corrected, Supplements and Notices to Mariners are printed on one side only, and two copies are issued to each ship—one to be cut and the slips pasted in at the appropriate places, the other to be retained intact for reference.

To make the notations and paste in the slips, as the Notices to Mariners are received, is one of the duties of the navigating officer demanding faithful attention.

It must, however, be understood that Sailing Directions will rarely be correct in all details, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide, for which purpose, for ordinary navigation, it is sufficient.

The Tide Tables, which are published annually by the United States Coast and Geodetic Survey, give the predicted times and heights of the high and the low waters for every day in the year at 70 of the principal ports of the world, and, through the medium of these by means of tidal differences and ratios, at a very large number of subordinate ports. The Tables for the Atlantic and the Pacific coast ports of the United States are also published separately.

It should be remembered that these tables aim to give the times of high and low water, and not the times of turning of the current or of slack water, which may be quite different.

Notices to Mariners, containing fresh information pertaining to all parts of the world, are published weekly and mailed to all United States ships in commission, Hydrographic branch offices and agencies, United States consulates, and foreign hydrographic offices. Copies are furnished free by the main office or by any of the branch offices on application.

With each Notice is sent also a separate sheet, giving the items relating to lights contained in the latest Notice, intended especially for use in correcting the Light Lists.

Pilot Charts of the North Atlantic and North Pacific oceans are published near the beginning of each month. These charts give the average conditions of wind and weather, barometer, percentage of fog and gales, and routes for steam and sailing vessels for the month of issue; ice and derelicts of the preceding month; ocean currents and magnetic variation for the year; storm tracks of preceding years; and much other useful information. They are furnished free only in exchange for marine data or observations.

Hydrographic Bulletins, published weekly, are supplemental to the North Atlantic Pilot Chart and contain the latest news of wrecks and derelicts along the American coast and ocean routes, Arctic ice, reports of the use of oil to calm the sea, and other information for mariners. They are to be had free upon application.

THE USE OF CHARTS.

Accuracy of chart.—The value of a chart must manifestly depend upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become.

To judge of a survey, its source and date, which are generally given in the title, are a good guide. Besides the changes that may have taken place since the date of the survey in waters where sand or mud prevails, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail; until a plan founded on such a survey is tested it should be regarded with caution. It may indeed be said that, except in well-frequented harbors and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of the survey, remembering, however, that the chart is not expected to show all soundings that were obtained. When the soundings are sparse or unevenly distributed it may be taken for granted that the survey was not in great detail.

Large or irregular blank spaces among soundings mean that no soundings were obtained in these spots. When the surrounding soundings are deep it may fairly be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch or pinnacle rock.

A wide berth should therefore be given to every rocky shore or patch, and instead of considering a coast to be clear, the contrary should be assumed.

Fathom curves a caution.—Except in plans of harbors that have been surveyed in detail, the 5-fathom curve on most charts may be considered as a danger line, or caution against unnecessarily approaching the shore or bank within that line on account of the possible existence of undiscovered inequalities of the bottom, which only an elaborate detailed survey could reveal. In general surveys of coasts, or of little-frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for so detailed a survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The 10-fathom curves on rocky shores is another warning, especially for ships of heavy draft.

A useful danger line will be obtained by tracing out with a colored pencil or ink the line of depth next greater than the draft of the ship using the chart. For vessels drawing less than 18 feet the edge of the sanding serves as a well-marked danger line.

Charts on which no fathom curves are marked must especially be regarded with caution, as indicating that soundings were too scanty and the bottom too uneven to enable the lines to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed around, as it is doubtful how closely the spot may have been examined and whether the least depth has been found.

The chart on largest scale should always be used on account of its greater detail and the greater accuracy with which positions may be plotted on it.

Caution in using small-scale charts.—In approaching the land or dangerous banks regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large-scale chart, whereas on one of small scale the same amount of displacement means a large fraction of a mile.

Distortion of printed charts.—The paper on which charts are printed has to be damped. On drying distortion takes place from the inequalities of the paper, which greatly varies with different paper and the amount of the original damping, but it does not affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted on the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

Mercator's chart.—Observed bearings are not identical with those measured on the mercator chart (excepting only the bearings North and South, and East and West on the equator) because the line of sight, except as affected by refraction, is a straight line, and lies in the plane of the great circle, while the straight line on the chart

(except the meridian line) represents, not the arc of a great circle, but the loxodromic curve, which on the globe is a spiral terminating at the pole, or, if the direction be East and West, a circle of latitude.

The difference is not appreciable with near objects, and in ordinary navigation may be neglected. But in high latitudes, when the objects are very distant, and especially when lying near east or west, the bearings must be corrected for the convergence of the meridians in order to be accurately placed on the mercator chart, which represents the meridians as parallel.

On the polyconic chart, since a straight line represents (within the limits of 15 or 20 degrees of longitude) the arc of a great circle or the shortest distance between two points, bearings on the chart are identical with observed bearings.

The Mercator projection is evidently unsuited to surveying, for which purpose the polyconic projection is used by the Hydrographic Office and the Coast and Geodetic Survey, and the gnomonic projection by the British service.

Notes on charts should always be read with care, as they may give important information that can not be graphically represented.

Buoys.—It is manifestly impossible to rely on buoys always maintaining their exact positions. Buoys should therefore be regarded as warnings, and not as infallible navigating marks, especially when in exposed places; and a ship's position should always, when possible, be checked by bearings or angles of fixed objects on shore.

Gas buoys.—The lights shown by gas buoys can not be implicitly relied on; the light may be altogether extinguished, or, if intermittent, the apparatus may get out of order.

Lights.—All the distances given in the light lists and on the charts for the visibility of lights are calculated for a height of 15 feet for the observer's eye. The effect of a greater or less height of eye can be ascertained by means of the table of distances of visibility due to the height, published in the light lists.

The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Refraction, too, may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light, the fact may be forgotten that aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the ship is on the circle of visibility corresponding with the usual height of the eye or unexpectedly nearer the light.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze and no dependence can be placed on its being seen.

The power of a light can be estimated by its order, as stated in the light lists, and in some cases by noting how much its visibility in clear weather falls short of the range corresponding to its height. Thus, a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the influence of the wind large areas of silence have been found in different directions and at different distances from the origin of sound, even in clear weather; therefore, too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly toward the land and is not observed by the lighthouse people until upon them; a ship may have been for many hours in it and approaching the land in confidence, depending on the signal, which is not sounded. When sound travels against the wind it may be thrown upward. A man aloft might then hear it, though inaudible on deck.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide and should be faithfully used.

Tides.—A knowledge of the times of high and low water and of the amount of vertical rise and fall of the tide is of great importance in the case of vessels entering or leaving port, especially when the channel depths are less than or near their draft. Such knowledge is also useful at times to vessels running close along a coast in enabling them to anticipate the effect of the tidal currents in setting them on or off shore. This is especially important in fog or thick weather.

The predicted times and heights of the high and low waters, or differences by which they may be readily obtained, are given in the tide tables for all the important ports of the world. The height at any intermediate time may be obtained by means of Table 2 for most of the principal tidal stations of the United States given in Table 1, and for the subordinate stations of Table 3 by multiplying its values by the ratio of mean ranges, provided the duration of rise and fall is sensibly the same at the subordinate as at the principal station. The intermediate height may also be obtained by plotting the predicted times and heights of high and low water and connecting the points by a curve. Such knowledge is often useful in crossing a bar or shallow flats.

Planes of reference.*—The plane of reference for soundings on Hydrographic Office charts made from United States Government surveys and on Coast and Geodetic Survey charts of the Atlantic coast of the United States is mean low water; on the Pacific coast of the United States as far as the strait of Fuca, it is the mean of the lower low waters; and from Puget sound to Alaska the Survey has adopted the harmonic or Indian tide plane, which is roughly that of the lowest low waters observed.

On most of the British Admiralty charts the plane of reference is the low water of ordinary springs; on French charts, the low water of equinoctial springs.

In the case of many charts compiled from old or various sources the plane of reference may be in doubt. In such cases, or whenever not stated on the chart, the assumption that the reference plane is mean low water gives the largest margin of safety.

Whichever plane of reference may be used for a chart, it must be remembered that there are times when the tide falls below it. Low water is lower than mean low water about half the time, and when a new or full moon occurs at perigee the low water is lower than the average low water of springs. At the equinoxes the spring range is also increased on the coasts of Europe, but in some other parts of the world, and especially in the Tropics, such periodic low tides may coincide more frequently with the solstices.

Wind or a high barometer may at times cause the water to fall below even a very low plane of reference.

On coasts where there is much diurnal inequality in the tides the amount of rise and fall can not be depended upon, and additional caution is necessary.

Mean sea level.—The important fact should be remembered that the depths at half tide are practically the same for all tides, whether neaps or springs. Half tide, therefore, corresponds with mean sea level. This makes a very exact plane of reference, easily found, to which it would be well to refer all high and low waters.

The tide tables give, in Table 3, for all the ports, the plane of reference to which tidal heights are referred and its distance below mean sea level.

If called on to take special soundings for the chart at a place where there is no tidal bench mark, mean sea level should be found and the plane for reductions established at the proper distance below it, as ascertained by the tide tables, or by observations, or in some cases, if the time be short, by estimation, the data used being made a part of the record.

* The distinction between "rise" and "range" of the tide should be understood. The former expression refers to the height attained above the datum plane for soundings, differing with the different planes of reference; the latter, to the difference of level between successive high and low waters.

Tidal streams.—In navigating coasts where the tidal range is considerable especial caution is necessary. It should be remembered that there are indrafts to all bays and bights, although the general run of the stream may be parallel with the shore.

The turn of the tidal stream offshore is seldom coincident with the time of high and low water on the shore. In some channels the tidal stream may overrun the turn of the vertical movement of the tide by 3 hours, forming what is usually known as tide and half tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

The effect of the tidal wave in causing currents may be illustrated by two simple cases:

(1) Where there is a small tidal basin connected with the sea by a large opening.

(2) Where there is a large tidal basin connected with the sea by a small opening.

In the first case the velocity of the current in the opening will have its maximum value when the height of the tide within is changing most rapidly, i. e., at a time about midway between high and low water. The water in the basin keeps at approximately the same level as the water outside. The flood stream corresponds with the rising, and the ebb with the falling of the tide.

In the second case the velocity of the current in the opening will have its maximum value when it is high water or low water without, for then there is the greatest head of water for producing motion. The flood stream begins about three hours after low water, and the ebb stream about three hours after high water, slack water thus occurring about midway between the tides.

Along most shores not much affected by bays, tidal rivers, etc., the current usually turns soon after high water and low water.

The swiftest current in straight portions of tidal rivers is usually in the middle of the stream, but in curved portions the most rapid current is toward the outer edge of the curve, and here the water will be deepest. The pilot rule for best water is to follow the ebb tide reaches.

Countercurrents and eddies may occur near the shores of straits, especially in bights and near points. A knowledge of them is useful in order that they may be taken advantage of or avoided.

A swift current often occurs in a narrow passage connecting two large bodies of water, owing to their considerable difference of level at the same instant. The several passages between Vineyard sound and Buzzards bay are cases in point. In the Woods Hole passage the maximum strength of the tidal streams occurs near high and low water.

Tide rips are made by a rapid current setting over an irregular bottom, as at the edges of banks where the change of depth is considerable.

Current arrows on charts show only the most usual or the mean direction of a tidal stream or current; it must not be assumed that the direction of a stream will not vary from that indicated by the arrow. The rate, also, of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

FIXING POSITION.

Sextant method.—The most accurate method available to the navigator of fixing a position relative to the shore is by plotting with a protractor sextant angles between well-defined objects on the chart; this method, based on the “three-point problem” of geometry, should be in general use.

For its successful employment it is necessary: First, that the objects be well chosen; and, second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice.

Near objects should be used either for bearings or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in misplacing the position the longer the line to be drawn.

On the other hand, distant objects should be used for direction because less affected by a small error or change of position.

The three-arm protractor (station pointer of the British service) consists of a graduated brass circle with one fixed and two movable radial arms, the three beveled edges of the arms, if produced, intersecting at the exact center of the instrument. The edge of the fixed arm marks the zero of the graduation which enables the movable arms to be set at any angles with the fixed arm.

To plot a position, the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole.

The tracing-paper protractor, consisting of a graduated circle printed on tracing paper, is an excellent substitute for the brass instrument and in some cases preferable to it, as when, for instance, the objects angled on are so near the observer that they are more or less hidden by the circle of the instrument. The paper protractor also permits the laying down for simultaneous trial of a number of

angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through the three objects (in which case the sum of the observed angles equals the supplement of the angle at the middle object made by lines from the other two) it will be indeterminate, as it will plot all around the circle. An approach to this condition must be avoided. Near objects are better than distant ones, and, in general, up to 90° the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer, the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation.

A single angle and a range give in general an excellent fix, easily obtained and plotted.

Advantages of sextant method.—In war time, when the compass may be knocked away or rifle fire make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained at any point where the objects are visible. This contingency makes it especially desirable that all navigating officers of men-of-war should become expert in this method of fixing a ship's position.

In many narrow waters, also, where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by its means. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might under such circumstances put the ship ashore.

In all cases where great accuracy of position is desired, such as the fixing of a rock or shoal or of fresh soundings or new buildings as additions to the chart, the sextant should invariably be used. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. If a round of angles can be taken, the observer's accuracy is also checked. In the case of ordinary soundings a third angle need be taken only occasion-

ally; first, to check the general accuracy of the chart, as above stated; second, to make certain that the more important soundings, as at the end of a line, are correctly placed.

If communication can be had with the shore, positions may be fixed with great accuracy by occupying with theodolite or sextant two known points of the chart. The third angle of the triangle, that between the two points at the position sought, should be measured as a check.

The compass.—It is not intended that the use of the compass to fix the ship should be given up; in ordinary piloting the compass, with its companion, the alidade, may be more usefully employed for this purpose, although less accurate than the sextant.

If the accuracy of the chart be doubtful, the compass should be used in preference to the sextant.

In fixing by the compass it should always be remembered that the position by two bearings only, like that by two angles only, is liable to error. An error may be made in taking a bearing, or in applying to it the deviation, or in laying it on the chart. A third or check bearing should, therefore, be taken of some other object, especially when near the shore or dangers. A common intersection for the three lines assures accuracy.

Compass bearing and sextant angle.—When only two objects are visible, a compass bearing and a sextant angle may be used, and a better fix obtained than by two bearings.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called “bow and beam bearing,” the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy, and is an excellent fix for a departure, but does not insure safety, as the object observed and any dangers off it are abeam before the position is obtained.

By taking the bearings at two points and four points on the bow, a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current. Taking afterwards the beam bearing gives, with slight additional trouble, the distance of the object when abeam; such beam bearings and distances, with the times, should be continuously recorded as fresh departures, the importance of which will be appreciated in cases of being suddenly shut in by fog.

A table of multipliers of the distance run in the interval between any two bearings of an object, the product being its distance at the time of the second bearing, is given in the light list and in Bowditch.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten. In employing the horizontal danger angle, however, caution is necessary, as, should the chart be inaccurate, i. e., should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

The vertical danger angle may be conveniently used when passing elevated points of known heights, such as lighthouses, cliffs, etc. The computation of the distance corresponding to the height of the object and its angular elevation requires for small distances merely the solution of a plane right triangle; the natural cotangent of the angle multiplied by the height in feet gives the distance in feet. The convenient use of this method, however, requires tables such as those published by Captain Lecky in his little book entitled “The Danger Angle and Offshore Distance Tables.”

This book very usefully extends the vertical angle method to finding a ship's position at sea by observing the angular altitude of a peak of known height and its bearing. The tables give heights up to 18,000 feet and distances up to 110 miles. When the angles are not too large they should be observed “on and off the limb” and the index error of the sextant thus eliminated, in preference to correcting for it the single altitude. It must be remembered that in high latitudes the bearing of a distant object needs correction for the convergence of the meridians before being laid down on a mercator chart. The correction may be found by the following formula, using the approximate position: The sine of the correction equals the product of the sine of half the difference of longitude by the sine of the middle latitude. It is applied on the equatorial side of the observed bearing, and its effect is always to increase the latitude of the observer.

Soundings taken at random are of little value in fixing or checking position and may at times be misleading. In thick weather, when near or closing the land, soundings should be taken continuously and at regular intervals, and, with the character of the bottom, systematically recorded. By laying the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship, and then moving the paper over the chart parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined. This plan was suggested by Lord Kelvin, whose admirable sounding machine renders the operation of sounding possible in quite deep water without slowing down the ship and consequent loss of time.

Dumb compass.—All ships should be supplied with the means of taking accurate bearings both by day and by night. The standard

compass is not always conveniently placed for the purpose; in such case some species of alidade or dumb compass is of great importance. The utility of such an instrument in ascertaining the change of bearing of an approaching ship's light should not be forgotten.

Sumner's method.—Among astronomical methods of fixing a ship's position the great utility of Sumner's method should be well understood, and this method should be in constant use. The Sumner line—that is, the line drawn through the two positions obtained by working the chronometer observation for longitude with two assumed latitudes, or by drawing through the position obtained with one latitude a line at right angles to the bearing of the body as obtained from the azimuth tables—gives at times invaluable information, as the ship must be somewhere on that line provided the chronometer is correct. If directed toward the coast, it marks the bearing of a definite point; if parallel with the coast the distance of the latter is shown. Thus the direction of the line may often be usefully taken as a course. A sounding at the same time with the observation may often give an approximate position on the line. A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The Sumner lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day and in combination with the sun gives an excellent fix.

The morning and evening twilight observations, besides their great accuracy, possess the additional advantage of greatly extending the ship's reliable reckoning beyond the limits of the ordinary day navigation and correspondingly restricting the dead-reckoning uncertainties of the night. An early morning fix in particular is often of great value.

Observations of the stars at night require the use of the star telescope in order to define the horizon. Though the same degree of accuracy as at twilight can not be expected, night observations are a very valuable dependence and should be assiduously practiced.

Piloting.—The navigator, in making his plan for entering a strange port, should give very careful previous study to the chart and should carefully select what appear to be the most suitable marks for use, also providing himself with substitutes, to use in case those selected as most suitable should prove unreliable in not being recognized with absolute certainty. It must be remembered that buoys seen at a distance in approaching a channel are often difficult to place or identify, because all may appear equally distant,

though in reality far apart. Ranges should be noted, if possible, and the lines drawn, both for leading through the best water in channels and also for guarding against particular dangers; for the latter purpose safety bearings should in all cases be laid down where no suitable ranges appear to offer. The courses to be steered in entering should also be laid down and distances marked thereon. If intending to use the sextant and danger angle in passing dangers, and especially in passing between dangers, the danger circles should be plotted and regular courses planned, rather than to run haphazard by the indications of the angle alone, with the possible trouble to be apprehended from wild steering at critical points.

The alidade or dumb compass should invariably be mounted in entering or leaving port and kept faithfully set to the magnetic direction of the ship's head, changing promptly with every change of course, so that the observed bearings may be magnetic, and therefore ready for the chart without the necessity of waiting to apply corrections. The chart should be on the bridge in readiness for reference or use in plotting positions.

The ship's position should not be allowed to be in doubt at any time, even in entering ports considered safe and easy of access, and should be constantly checked, continuing to use for this purpose those marks concerning which there can be no doubt until others gradually and unmistakably declare themselves.

The ship should ordinarily steer exact courses and follow an exact line, as planned from the chart, changing course at precise points, and, where the distances are considerable, her position on the line should be checked at frequent intervals, with recordings of time and patent log. This is desirable even where it may seem unnecessary for safety, because if running by the eye alone and the ship's exact position be suddenly required, as in a sudden fog or squall, fixing at that particular moment may be attended with difficulty.

The habit of running exact courses with precise changes of course will be found most useful when it is desired to enter port or pass through inclosed waters during fog by means of the buoys; here safety demands that the buoys be made successively, to do which requires, if the fog be dense, very accurate courses and careful attention to the times, the patent log, and the set of the current; failure to make a buoy as expected leaves as a rule no safe alternative but to anchor at once, with perhaps a consequent serious loss of time.

It is a useful point to remember that in passing between dangers where there are no suitable leading marks, as, for instance, between two islands or an island and the main shore, with dangers extending from both, a mid-channel course may be steered by the eye alone with great accuracy, as the eye is able to estimate very closely the direction midway between visible objects.

In piloting among coral reefs or banks, a time should be chosen when the sun will be astern, conning the vessel from aloft or from an elevated position forward. The line of demarcation between the deep water and the edges of the shoals, which generally show as green patches, is indicated with surprising clearness. This method is of frequent application in the numerous passages of the Florida keys.

Changes of course should in general be made by exact amounts, naming the new course or the amount of the change desired, rather than by ordering the helm to be put over and then steadying when on the desired heading, with the possibility of the attention being diverted and so of forgetting in the meantime, as may happen, that the ship is still swinging. The helmsman, knowing just what is desired and the amount of the change to be made, is thus enabled to act more intelligently and to avoid wild steering, which in narrow channels is a very positive source of danger.

Coast piloting involves the same principles and requires that the ship's position be continuously determined or checked as the landmarks are passed. On well-surveyed coasts there is a great advantage in keeping near the land, thus holding on to the marks and the soundings, and thereby knowing at all times the position, rather than keeping offshore and losing the marks, with the necessity of again making the land from vague positions, and perhaps the added inconvenience of fog or bad weather, involving a serious loss of time and fuel.

The route should be planned for normal conditions of weather, with suitable variations where necessary in case of fog or bad weather or making points at night, the courses and distances, in case of regular runs over the same route, being entered in a notebook for ready reference, as well as laid down on the chart. The danger circles for either the horizontal or the vertical danger angles should be plotted, wherever the method can be usefully employed, and the angles marked thereon; many a mile may thus be saved in rounding dangerous points, with no sacrifice in safety. Ranges should also be marked in, where useful for position or for safety, and also to use in checking the deviation of the compass by comparing, in crossing, the compass bearing of the range with its magnetic bearing, as given by the chart.

Changes of course will in general be made with mark or object abeam, the position (a new "departure") being then, as a rule, best and most easily obtained. The alidade, kept set to the ship's magnetic heading, should be at all times in readiness for use, and the chart where it may be readily consulted by the officer of the watch. The sextant should also be kept conveniently at hand.

A continuous record of the progress of the ship should be kept by the officer of the watch, the time and patent log reading of all

changes of course and of all bearings, especially the two and four point bearings, with distance of object when abeam, being noted in a book kept in the pilot house for this especial purpose. The ship's reckoning is thus continuously cared for as a matter of routine and without the presence or particular order of the captain or navigating officer. The value of thus keeping the reckoning always fresh and exact will be especially appreciated in cases of sudden fog or when making points at night.

Where the coastwise trip must be made against a strong head wind, it is desirable, with trustworthy charts, to skirt the shore as closely as possible in order to avoid the heavier seas and adverse current that prevail farther out. In some cases, with small ships, a passage can be made only in this way. The important saving of coal and of time, which is even more precious, thus effected by skillful coast piloting makes this subject one of prime importance to the navigator.

Change in the variation of the compass.—The gradual change in the variation must not be forgotten in laying down on the chart courses and positions by bearings. The magnetic compasses placed on the charts for the purpose of facilitating the plotting become in time slightly in error, and in some cases, such as with small scales or when the lines are long, the displacement of position from neglect of this change may be of importance. The date of the variation and the annual change, as given on the compass rose, facilitate corrections when the change has been considerable. The compasses are reengraved when the error amounts to a degree. More frequent alterations on one spot in a copper plate would not be practicable.

The geographical change in the variation is in some parts of the world so rapid as to need careful consideration, requiring a frequent change of the course. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles.

Local magnetic disturbance of the compass on board ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship. Observation shows that disturbance of the compass in a ship afloat is experienced in only a few places on the globe.

Magnetic laws do not permit of the supposition that the visible land causes such disturbance, because the effect of a magnetic force diminishes so rapidly with distance that it would require a local center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong, the compass may be temporarily deflected when passing over such a spot; but the area of disturbance will be small unless there are many centers near together.

The law which has hitherto been found to hold good as regards local magnetic disturbance is that north of the magnetic equator the north end of the compass needle is attracted and south of the magnetic equator repelled by any center of disturbance.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance the position should be fixed, and the facts, as far as they can be ascertained, reported.

Use of oil for modifying the effect of breaking waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil skillfully applied may prevent much damage both to ships (especially of the smaller classes) and to boats by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:

1. On free waves, i. e., waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances, but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.
4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.
5. It is useful in a ship or boat, either when running, or lying-to, or in wearing.
6. No experiences are related of its use when hoisting a boat at sea or in a seaway, but it is highly probable that much time would be saved and injury to the boat avoided by its use on such occasions.
7. In cold water the oil, being thickened by the lower temperature and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.
8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to facilitate leakage of the oil.

The positions of these bags should vary with the circumstances. Running before the wind, they should be hung on either bow—e. g., from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying-to, the weather bow, and another position farther aft, seem the best places from which to hang the bags, using sufficient line to permit them to draw to windward while the ship drifts.

9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect can not be so much trusted.

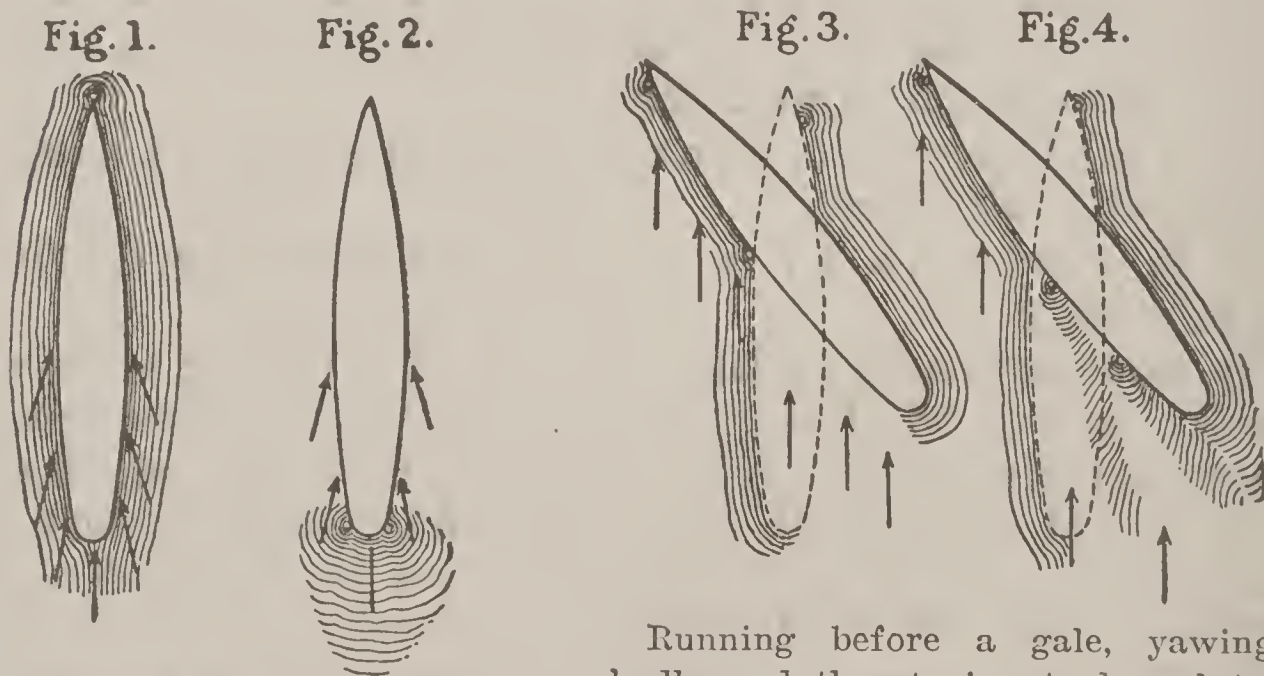
On a bar, with the ebb tide running, it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat and the bag readily hauled on board for refilling, if necessary.

ILLUSTRATIONS AND BRIEF RULES.*

[In the illustrative figures, the flowing lines represent the spreading oil and the arrows denote the direction of the wind and sea.]



Scudding before a gale, Figure 1, distribute oil from the bow by means of oil bags or through waste pipes; it will thus spread aft and give protection both from quartering and following seas.

If distributed only astern, Figure 2, there will be no protection from the quartering sea.

Running before a gale, yawing badly and threatening to broach-to, Figures 3 and 4, oil should be distributed from the bow and abaft the beam, on both sides.

In Figure 3, for instance, where it is only distributed at the bow, the weather quarter is left unprotected when the ship yaws.

In Figure 4, however, with oil bags abaft the beam as well as forward, the quarter is protected.

*From prize essay of Capt. R. Karlowa, of Hamburg-American Steamship Co.

Fig. 5.



Fig. 6.

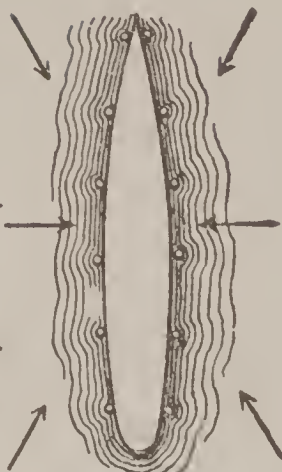


Fig. 7.



Fig. 8.



Lying-to, Figure 5, a vessel can be brought closer to the wind by using one or two oil bags forward, to windward. With a high beam sea, use oil bags along the weather side at intervals of 40 or 50 feet.

In a heavy cross sea, Figure 6, as in the center of a hurricane, or after the center has passed, oil bags should be hung out at regular intervals along both sides.

Drifting in the trough of a heavy sea, Figures 7 and 8, use oil from waste pipes forward and bags on weather side, as in Figure 8.

These answer the purpose very much better than one bag at weather bow and one at lee quarter, although this has been tried with some success, see Figure 7.

Fig. 9.



Fig. 11.



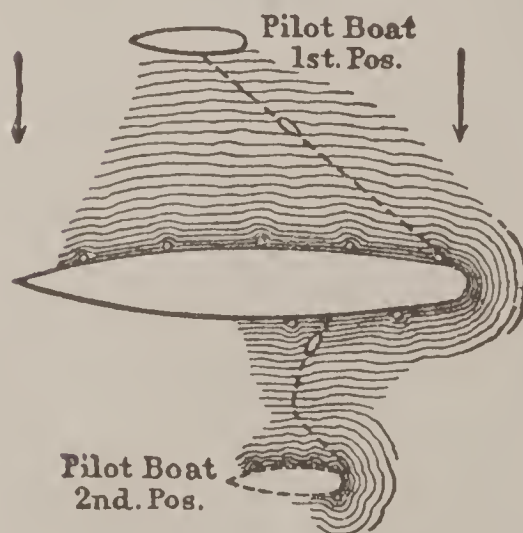
Fig. 10.

Steaming into a heavy head sea, Figure 9, use oil through forward closet pipes. Oil bags would be tossed back on deck.

Lying-to, to tack or wear, Figure 10, use oil from weather bow.

Cracking on, with high wind abeam and heavy sea, Figure 11, use oil from waste pipes, weather bow.

Fig. 12.



A vessel hove-to for a pilot, Figure 12, should distribute oil from the weather side and lee quarter. The pilot boat runs up to windward and lowers a boat, which pulls down to leeward and around the vessel's stern. The pilot boat runs down to leeward, gets out oil bags to windward and on her lee quarter, and the boat pulls back around her stern, protected by the oil. The vessels drift to leeward and leave an oil slick to windward, between the two.

Fig.13.



Fig.14.



Towing a vessel in a heavy sea, oil is of the greatest service and may prevent parting the hawser. Distribute from the towing vessel, forward on both sides, Figure 13. If used only aft, the tow alone gets the benefit.

At anchor in an open roadstead, use oil in bags from jib boom, or haul them out ahead of the vessel by means of an endless rope rove through a tail block secured to the anchor chain, Figure 14.

CHAPTER I.

CANADA AND THE EASTERN MARITIME PROVINCES, GENERAL REMARKS—GULF AND RIVER ST. LAWRENCE—NAVIGATION—ICE — FOGS — WINDS — CURRENTS — TIDES AND TIDAL STREAMS — LIGHTS — BUOYS — SIGNAL STATIONS—TELEGRAPH CABLES — DOCKS — COAL — REPAIRS — PILOTS—NOVA SCOTIA BANKS—GENERAL DIRECTIONS FOR THE GULF AND RIVER ST. LAWRENCE.

Canada.—The Dominion of Canada is a confederation of the colonies of British North America, and comprises the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward island, British Columbia, Manitoba, the Northwest and Yukon territories, besides Ungava; in fact, the whole of British North America, except Newfoundland and Labrador. It extends from the Atlantic to the Pacific; its area is estimated at 3,654,000 square miles, and its population was 5,338,883 in 1901.

Climate.—The climate of Canada can not be described as a whole, for there are many climates. Not only do the several provinces and territories differ materially, but there are also great variations within most of the provinces themselves. Generally, the climates in the localities near the oceans are milder and damper than in the interior. Throughout the greater part there are extremes of temperature in summer and winter, but in summer the nights are cool, and in winter the air is dry, bracing, and healthy. The range of the thermometer at Quebec in one year was 126°, or from 96° F. above to 30° F. below zero.

The Eastern Maritime provinces—Ontario, the most populous and wealthy province of the Dominion, is bounded on the east by Quebec, on the north by James bay and the Albany and English rivers, on the west by Manitoba, and on the south by the St. Lawrence and the Great Lakes. Its area is 181,000 square miles, and the population in 1901 was 2,167,978.

There is only one large city, Toronto, which contains 207,971 inhabitants, but there are several smaller cities and towns; of these Ottawa, with a population of 59,902 inhabitants, is the capital of the Dominion.

Products and trade.—Ontario is largely an agricultural country and its resources are very great, the province being rich in minerals.

The principal manufactures are agricultural implements, iron and wood ware, wagons and carriages, railway engines and rolling stock, cottons, woollens, paper, soap, etc.

In 1902 the value of the exports, consisting of manufactured goods, agricultural products, animals and their products, timber and minerals, was \$48,597,480, and that of the imports was \$86,232,560.

Climate.—The climate is very diversified; in the southwestern part the winters are not severe, and the summers, owing to the tempering influence of the Great Lakes, are not oppressively hot; in the valleys of the Ottawa and the St. Lawrence the winters are moderately cold, but bracing and exhilarating. To the northward and northwestward of lake Superior the winters are long and cold, with at times extremely low temperatures.

Quebec, a province of the Dominion, lies eastward of Ontario; it is bounded on its southern and eastern sides by the United States, New Brunswick, Chaleur bay, the gulf of St. Lawrence, and Labrador. The province comprises Anticosti and the Magdalen islands. Its area is 347,000 square miles and the population in 1901 was 1,620,974. The principal cities are Quebec, the great seaport town of Canada, and Montreal, the commercial metropolis, and the chief center of the grain trade northward of New York.

Products and trade.—The land is very fertile and produces all cereals and wheat crops in abundance, as well as fruit, which grows luxuriantly, grapes, melons, peaches, and tomatoes maturing in the open. Cheese is largely exported. The lumber trade is extensive and manufactures of hardware and textile fabrics are largely carried on. The fisheries in the river and gulf St. Lawrence are very prolific, and the smaller rivers teem with fish.

On the north shore of the gulf of St. Lawrence the people generally obtain a livelihood from cod and seal fisheries, and from furs procured in the interior.

On both sides of the river, as far west as Metis on the south and Tadoussac on the north shore, the inhabitants are principally fishermen, owning small farms.

In the year ending June 30, 1902, the value of the exports of the province, consisting chiefly of manufactured goods, timber, animals and their products, and agricultural and dairy produce, was \$91,057,201, and that of imports was \$82,014,443.

Climate.—The climate is generally dry and healthy. It varies from the cold but bracing winters and the long warm summers of the St. Lawrence and Ottawa valleys to the long cold winters and the short cool summers of that portion of the province lying northward of the Height of Land.

The normal percentage of sunshine at Montreal is 46.

Nova Scotia, originally Acadia, a province of the Dominion, consists of a peninsula and Cape Breton island, which is separated from the main by the gut of Canso. Its extreme length is 350 miles and breadth about 120 miles, with an entire area of 20,907 square miles, about $\frac{1}{5}$ part of which consists of lakes, rivers, and inlets of the sea. Its population in 1901 was 459,116.

Nova Scotia is connected with New Brunswick by an isthmus only 10 miles in width. It is bounded on the north by Northumberland strait (which separates it from Prince Edward island) and the gulf of St. Lawrence; northeast, southeast, and south by the Atlantic ocean; west by the bay of Fundy, and northwest by New Brunswick.

Products and trade.—Agriculture and horticulture are among the principal industries in the province. Rye, oats, barley, Indian corn, potatoes, tomatoes, and all root crops grow in abundance; but wheat is not cultivated to any great extent. Apples and other fruits attain great perfection. Cottons and woolens are manufactured, and there are steel works at New Glasgow. There are also paper mills, sugar refineries, boot factories, agricultural and other machinery factories, and many sawmills. Mining is extensively carried on. Upward of 1,500,000 tons of coal are mined annually, the principal mines being at Pictou and Springhill. Other minerals are abundant, including tin, silver, manganese, gypsum, slates, etc.

The fisheries of Nova Scotia are very important, the waters abounding with mackerel, cod, herring, shad, salmon, halibut, haddock, lobsters, etc.

The chief exports are fish products, minerals, lumber, agricultural products, and general manufactures.

In the year ending June 30, 1902, the value of the exports (including Cape Breton island) was \$14,978,222, and of the imports \$12,510,752.

Cape Breton island is of an irregular triangular shape; on its western coast the only harbor is Port Hood, but its other sides are rugged and indented with numerous bays. An inlet, the Bras d'Or, enters the northeastern side of the island and forms a lake some 45 miles long, which is continued by a ship canal to St. Peter bay, on the southern coast; being deep enough for large vessels, it affords great facilities for commerce. The island, which formed a separate colony until 1819, and was in that year incorporated with Nova Scotia, has an area of 3,125 miles. The population in 1901 numbered 97,193.

The chief towns are Sydney, North Sydney, and Glacé bay.

Products.—The principal exports of the island are timber, fish, iron ore, and coal. Oats, wheat, turnips, and potatoes are extensively cultivated; horses, cattle, and sheep are reared, and cheese and butter produced. The chief coal mines are near Sydney, and at Cow and Glacé bays.

Numerous fresh and salt water fish are found, and the fishery employs about 3,000 men.

Climate.—The climate of Nova Scotia and Cape Breton island is healthy and milder than that of any other part of the Dominion, the average temperature being 65° in the summer and 25° in the winter, but the range is from 96° above to 32° below zero. The average annual rainfall is 38 inches, and the snowfall 75 inches, evenly distributed. Fogs are frequent on the coasts, but they do not extend far inland.

New Brunswick, a province of the Dominion, is bounded on the north and northwest by the province of Quebec, from which it is separated by the river Restigouche; on the north by Chaleur bay; on the east by the gulf of St. Lawrence and Northumberland strait; on the south by the bay of Fundy and part of Nova Scotia; and on the west by the State of Maine. Its area is about 27,105 square miles, and its population in 1901 was 331,093.

New Brunswick was settled by the French in 1604 and was ceded to Great Britain in 1763; it was first colonized by British subjects in 1764.

Products and trade.—The chief industry in New Brunswick is agriculture; and about one and a quarter million acres are under cultivation. Wheat, Indian corn, barley, buckwheat, and oats are the principal cereals raised; fruit and vegetables are largely grown; attention has been given to live stock. Coal is mined principally by farmers when other work is slack; the coal produced in 1900 was 10,000 tons. Antimony, iron, gypsum, and plumbago are found; 112,294 tons of gypsum were produced in 1900. A great portion of the country is covered by dense forests, and cutting and exporting pine and spruce timber afford much employment. The fisheries, both sea and river, are extensive, and some of the finest salmon fishing in the world is to be had. Shipbuilding is carried on to a considerable extent.

The chief exports are fish, timber, coal, iron, gypsum, manganese, and hay. The imports are flour, salt meat, coffee, tea, sugar, molasses, and fruit; also woolen, cotton, and silk goods. In the year ended June 30, 1901, the exports were valued at \$14,886,454, and the imports at \$6,741,848.

Climate.—The climate, though subject to extremes, is healthy. The average mean temperature in summer is 60° , and in winter 19° , but it ranges from 82° above to 11° below zero. The average annual rainfall is 32 inches, and the snowfall 99 inches, the latter extending from November to April, inclusive.

Prince Edward island, a province of the Dominion, is situated in the gulf of St. Lawrence, and is separated from Nova Scotia and

New Brunswick by Northumberland strait. The greatest length of the island is 102 miles; and its eastern part is about 30 miles broad, but the breadth is rendered extremely irregular by large bays, inlets, and rivers, which penetrate the island so that no part of it is distant more than 7 to 8 miles from navigable water. The area of the island is 2,133 square miles. The population in 1901 amounted to 103,258 inhabitants.

Charlottetown, the capital, had a population of 12,080 in 1901; the other towns are Georgetown, Summerside, and Souris.

Products and trade.—The inhabitants are almost exclusively engaged in agriculture and the breeding of horses and sheep; considerable attention, however, is devoted to the fisheries on the north coast.

The export trade of the island consists chiefly of agricultural produce and small quantities of lumber. There are factories for canning and preserving fish and meat. The total value of the exports from Prince Edward island in 1902 amounted to \$801,013; and of the imports to \$643,829.

Climate.—The climate is less severe than in the neighboring provinces; not quite so cold in winter, nor so hot in summer, being tempered by the sea breezes; but the advance of spring is checked by northerly winds which drive ice down the gulf, so that Northumberland strait is sometimes filled with ice until the middle of May, and the outbreak of vegetable life is frequently retarded till June is well advanced; there is seldom any settled weather before July.

Physical features and geology—Ontario and Quebec.—The surface of the country of the provinces of Ontario and Quebec is varied, consisting of extensive lakes and rivers, large areas of agricultural land, and immense forests. One of the most striking features of the province of Ontario and the northern part of that of Quebec is the great Laurentian range, formed of very ancient crystalline rocks, which occupies the Labrador peninsula, and spreading round the southern end of Hudson bay extends northwestward through the continent. It forms the watershed between Hudson bay and the St. Lawrence, and its average height is about 1,500 feet above the sea, but it is considerably higher where it fronts the Atlantic; elsewhere it is lower. Over it generally there are very numerous lakes, ponds, and winding streams. Where not wooded its surface often consists largely of rock masses, chiefly granites and gneisses, referable to the Laurentian system, with crystalline schists of the Huronian, and occasional outliers of Cambrian.

Another feature is the immense chain of fresh-water lakes, the area of those connected with the St. Lawrence system alone being about 90,000 square miles.

In the provinces of Ontario and Quebec, the principal rivers, next to the St. Lawrence, are the Ottawa, its chief tributary, and the Saguenay, which drains lake St. John into the St. Lawrence.

Ontario and Quebec are generally well wooded, and mines, particularly of gold, are worked in some of the tracts characterized by the Huronian rocks. Copper, asbestos, and iron are found.

The plain of the St. Lawrence valley extends westward from the city of Quebec to lake Huron, and this is the greatest area of arable land in Eastern Canada. It lies northwestward of the Notre Dame ranges, northward of lakes Ontario and Erie, and southward of the Laurentian range. It is underlaid by nearly horizontal and undisturbed rocks, mainly limestones. Petroleum and natural gas occur in the rocks underlying this plain in Ontario, but there are scarcely any metalliferous deposits. In this region the soil is very fertile, and it contains the largest centers of population.

The maritime provinces of Eastern Canada southward of the St. Lawrence, including Nova Scotia, New Brunswick, Prince Edward island, and the southeastern part of Quebec, which are very irregular in shape and have an extended coast-line in the Atlantic and the gulf of St. Lawrence, may be regarded as a northern continuation of the Appalachian mountains of the United States.

Nova Scotia.—From cape Canso a range of high lands, which does not attain the height of mountains, runs in a sweep through Nova Scotia to cape Sable. Cobequid range, running parallel with the preceding range along the northern part of the province from cape Porcupine, in the gut of Canso, to cape Chignecto, in the bay of Fundy, reaches heights of 1,100 feet.

Its summits are of crystalline, granitoid, and syenitic masses, and are covered with valuable timber, while in the intervening depressions agricultural products grow luxuriantly. Between these parallel ranges is a wide and fertile valley. Valuable coal fields occur on part of the coasts in the gulf of St. Lawrence, and metalliferous ores of various kinds are found.

Cape Breton island.—In this island there are several ranges of hills, and the northern promontory is a plateau which rises to the height of 1,200 feet. The prevailing rocks belong to the carboniferous system, interrupted in places by igneous or metamorphic rocks. Coal, limestone, gypsum, iron, and slate are found, and salt springs exist.

New Brunswick.—The province of New Brunswick exhibits alternately parallel ridges with wide intervening areas of nearly flat silurian and carboniferous rocks. The ridge of greatest elevation and extent traverses the northern part of the province from Chaleur bay to the state of Maine, and it reaches heights of 1,200 to 2,000 feet, with higher individual peaks.

The carboniferous rocks occupy a large area, but the coal seams, so far developed, are thin and unimportant. Mineral ores of various kinds are found. It is well watered, rivers, lakes, and bays are numerous, and there are extensive tracts of good arable land.

Quebec—Southeastern part.—Notre Dame mountains run through the southeastern part of Quebec and terminate in Gaspé peninsula as Shickshoe mountains. Notre Dame range seldom exceeds 1,500 feet in height. The whole of Gaspé peninsula may be considered a block of table-lands, about 1,500 feet in height, in which the river courses are deep and narrow excavations. Rising from this, Shickshoe mountains are a conspicuous range of high lands, extending about 65 miles from the Matane to the eastern side of Ste. Anne des Monts. They stand on a breadth of 2 to 6 miles at a distance of about 12 miles from the St. Lawrence, and rise into points, attaining heights of 3,000 to 4,000 feet. The country connected with these ranges presents a rolling rather than a rugged mountainous surface, and for the most part is capable of tillage or pasturage.

Prince Edward island.—This island is undulating, and its highest part does not exceed 500 feet above the sea; it is in general much lower, especially near the coast. It is based on permo-carboniferous and triassic rocks affording a red and very fertile soil, much of which is under cultivation. Cliffs of red sandstone prevail on its coasts, except on the north side where long ranges of sand hills and sand bars have been thrown up by the sea.

Communication.—Steamship lines running from Canadian ports:

Line.	Ports from—		Port to—	Sailings.	
	Summer.	Winter.		Summer.	Winter.
Allan line	Montreal and Quebec.	St. John and Halifax.	Liverpool.....	Weekly.....	Weekly.
Allan line	Montreal and Quebec.	Halifax and Portland.	Glasgow	Weekly.....	Weekly.
Allan line	Montreal and Quebec.	.....	London.....	Fortnightly.	
Allan line	Montreal and Quebec.	St. John and Halifax.	Cherbourg or Havre.	Fortnightly.	
Canada-Jamaica....	Halifax.....	Halifax.....	Santiago de Cuba, Habana, Kingston, and outports, Jamaica.	Twice a month.	Twice a month.
Canada-South African line.	Montreal and Quebec.	St. John and Halifax.	Cape town, East London, Port Elizabeth, Durban.	Monthly....	Monthly.
Canadian Ocean and Inland line.	Montreal and Quebec.	Portland	Rotterdam	Fortnightly.	Fortnightly.
Canadian Pacific Railway: Atlantic lines.	Montreal	St. John	Liverpool	Weekly.....	Weekly.
Canadian Pacific Railway: Atlantic lines.	Montreal	St. John	Bristol.....	Weekly.....	Fortnightly.
Canadian Pacific Railway: Atlantic lines.	Montreal	St. John	London	Every ten days.	Every ten days.
Canadian Pacific Railway: Atlantic lines.	Montreal and Quebec.	St. John	Antwerp	Weekly.....	Fortnightly

Line.	Ports from—		Port to—	Sailings.	
	Summer.	Winter.		Summer.	Winter.
Dominion line.....	Montreal and Quebec.	Halifax and Portland.	Liverpool	Weekly.....	Weekly.
Dominion line.....	Montreal and Quebec.	Portland	Bristol.....	Fortnightly	Fortnightly.
Donaldson line	Montreal and Quebec.	St. John	Glasgow	Weekly.....	Weekly.
Eastern Steamship company.	St. John	St. John	Eastport, Portland, and Boston.	Daily	Twice a week.
Furness line.....	Halifax	Halifax	St. John's, Newfoundland.	Fortnightly	Fortnightly.
Furness line.....	Halifax	Halifax	Havre	Monthly....	Monthly.
Furness line.....	St. John and Halifax.	St. John and Halifax.	London	Weekly.....	Weekly.
Furness-Allan line .	Halifax	Halifax	Liverpool, via St. John's, Newfoundland.	Every ten days.	Every ten days.
Hamburg-American line.	Montreal and Quebec.	.....	Hamburg.....	Every ten days.	
Hansa-St. Lawrence line.	Montreal and Quebec.	.....	Antwerp	Fortnightly	
Head line.....	Montreal and Quebec.	St. John and Halifax.	Belfast and Dublin.	Weekly.....	Fortnightly.
Leyland line	Montreal and Quebec.	Portland	Antwerp	Fortnightly	Fortnightly.
Leyland line	Quebec .....	.....	London	Fortnightly	
Lord line	Montreal and Quebec.	.....	Cardiff	Monthly....	
Manchester line	Montreal and Quebec.	St. John and Halifax.	Manchester	Weekly.....	Fortnightly.
Pickford and Black.	Halifax and St. John.	Halifax and St. John.	West Indian ports ..	Fortnightly	Fortnightly.
Plant line	Halifax	Halifax	Boston	Twice a week.	Twice a week.
Plant line	Halifax	Halifax	St. Pierre, Miquelon.	Fortnightly	Fortnightly.
Red Cross line.....	Halifax	Halifax	New York	Every ten days.	Every ten days.
Thomson line.....	Montreal and Quebec.	Portland	London	Weekly.....	Weekly.
Thomson line.....	Montreal and Quebec.	.....	Leith	Fortnightly	
Thomson line.....	Montreal and Quebec.	.....	Aberdeen	Monthly....	

The North-Western Steamship company run steamers frequently from Chicago, via the Welland canal and St. Lawrence river, to Hamburg, Liverpool, and London during the open season.

During the open season steamers of the Black Diamond line afford weekly communication between Montreal, Quebec, Pictou, Charlottetown, Sydney, Cape Breton island, and St. John's, Newfoundland, and there is regular communication between the ports of Nova Scotia, Prince Edward island, New Brunswick, and Quebec. Steamers of the Quebec Steamship company run fortnightly from Quebec to Summerside, Charlottetown and Pictou; those of the Gaspé line run fortnightly from Quebec to Gaspé, calling at all the ports on the south shore of the lower St. Lawrence. Vessels of the North Shore Steamship line run every ten days from Quebec to the ports on the north shore eastward to Eskimo point. Steamers run three times a week between Sydney, Cape Breton island, and Port Basque, Newfoundland, connecting with the railways. In summer the Canadian Pacific Railway company runs steamers from Owen sound, in Georgian bay, lake Huron, to Port Arthur, lake Superior.

Communication between the Prince Edward Island railroad and the Intercolonial railroad is afforded in summer by steamer between Sum-

merside and point du Chêne, between Charlottetown and Pictou, and between Georgetown and Pictou; and in winter by specially built steamers between Georgetown and Pictou, and between Charlottetown and Pictou. There is also further provision made for communication by ice boats from cape Traverse; these cross the strait to cape Tormentine, on the mainland, a distance of about 9 miles.

Railroads.—The principal railroad systems in Canada are the Intercolonial, Canadian Pacific, and Grand Trunk.

The Intercolonial is a government line affording communication between Montreal and Quebec and the chief towns on the southern shore of the St. Lawrence, below Quebec, and those on the western shore of the gulf. It touches at six Atlantic ocean and St. Lawrence gulf ports, namely, point du Chêne, Pictou, Halifax, St. John, Sydney, and North Sydney. The distance by this line from Sydney to Montreal is 990 miles; its total length is 1,300 miles.

A ferry ice-breaking steamer takes the trains across the gut of Canso.

The Canadian Pacific system has its eastern terminus at St. John, New Brunswick, and its western terminus at the city of Vancouver, British Columbia. The transcontinental line passes through Montreal, Ottawa, Winnipeg, and the principal towns en route. Quebec and Montreal are connected by a line on the north side of the St. Lawrence. A line also runs from Montreal to Windsor, Ontario, passing through Toronto and the chief towns between; and a branch runs from Toronto to Owen sound, Georgian bay, lake Huron. There are numerous other branches, and the total length of the line is 6,874 miles. The distance by this railroad from Montreal to Vancouver is 2,906 miles.

The Grand Trunk system has its eastern terminus at Portland, in the State of Maine, and its western Canadian termini at Sarnia and Windsor, where connections are made with the United States railroads. It touches at Quebec and Montreal; above Montreal it passes along the north shore of the St. Lawrence river, and the north shores of lakes Ontario and Erie, and has stations at Toronto and the principal towns. It has many branches in the western part of the province of Ontario. The total length of the line is 3,153 miles.

The Canada Atlantic line has its western terminus at Parry sound, Georgian bay, lake Huron, and it runs eastward through Ottawa. It is used almost entirely for freight, carrying the grain, which is taken from the western and northwestern districts, to Parry sound by steamers. There is also a railroad from Quebec to lake St. John, whence a branch runs to Chicoutimi.

The lines in Prince Edward island run from Souris to Tignish with branches from mount Stewart to Georgetown, Charlottetown to Royalty junction, and Emerald junction to cape Traverse. The

total length is 211 miles. There are also numerous other railroads in Canada with a length altogether, in 1906, of 20,700 miles. The railroad distances are in statute miles.

Telegraph.—All the towns and nearly all the villages in the Dominion are connected by telegraph. Government lines also extend along the north shore of the river and gulf St. Lawrence to Chateau bay and Belle isle; to Anticosti, where it runs along the southern and eastern coasts of that island; to the Magdalen islands, and St. Paul island.

There are 31,218 statute miles of land telegraph lines owned and operated by public companies; the government owns 6,590 statute miles of land lines and 344 miles of cables.

The telephone is in general use in the more settled parts.

Waterways, sledge.—There are six important systems of government canals affording, with the river St. Lawrence connections, magnificent inland communications. The total length of canals proper open is $262\frac{1}{4}$ miles. The natural waterways still remain important factors in the transportation of the country. During the winter the settlements on the northern shore of the gulf and the lower part of St. Lawrence estuary are isolated, and the only communication, excepting perhaps by telegraph, is by sledge or dog train to the nearest railway station.

Standard time.—The mean time of the meridian of 60° W. longitude, or 4 hours slow of Greenwich mean time, is adopted as standard time in Nova Scotia and Prince Edward island, and that of the meridian of 75° W. longitude, or 5 hours slow of Greenwich mean time, in New Brunswick, Quebec, and Ontario.

The mean time of the meridian of 60° W. longitude is known as Atlantic standard time, and that of 75° W. as Eastern standard time.

Money.—The dollar of 100 cents. The value of the money of the United Kingdom is fixed by law as follows: £1 is equal to \$4.86; crown, \$1.20; the half crown, florin, shilling, and sixpence at proportionate rates. The Dominion has no gold coinage, but the English sovereign and the United States gold eagle of \$10 with multiples and halves are legal. Notes are issued by the government for \$4, \$2, and \$1.25. No bank is allowed to issue notes of less than \$5.

Weights and measures.—Legal weights and measures are the imperial yard, imperial pound avoirdupois, imperial gallon, and imperial bushel.

The hundredweight is 100 pounds and the ton 2,000 pounds avoirdupois, as in the United States.

Holidays.—The public holidays in the Dominion of Canada generally are New Year's day, Ash Wednesday, Good Friday, Easter Monday, H. B. M. the late Queen Victoria's birthday, Dominion day, Thanksgiving day (usually in November), and Christmas day.

THE GULF OF ST. LAWRENCE.

The gulf of St. Lawrence is an irregularly shaped inland sea inclosed on its northern and southwestern sides by Canadian territory, and on its eastern side by Newfoundland. Its area is 101,562 square miles.

Cabot strait, its principal entrance, lying between Cape Breton island and Newfoundland, is 55 miles wide; while Belle Isle strait, by which it communicates with the Atlantic at its northeastern end, is about 10 miles wide. It is also connected with the ocean by the gut of Canso, which separates Nova Scotia from Cape Breton island, and has a width of less than half a mile.

Cape Breton island forms the southeastern side of the gulf: St. Paul island is in Cabot strait: and the gulf contains the Magdalen group, Prince Edward island, and Anticosti.

The St. Lawrence River system, under the name St. Louis river, rises near the source of the Mississippi and the Red rivers, and flows into lake Superior, the surface of which is 602 feet above the sea; thence it is joined by St. Mary's river to lake Huron. Below lake Huron, which receives the waters of lake Michigan from the south, it flows, at about the same level, by St. Clair river and lake and Detroit river into lake Erie, whence the river Niagara descends 326 feet to lake Ontario, which is 247 feet above the sea. The St. Lawrence river proper issues from lake Ontario and flows northeastward for some 750 miles, presenting the character, first, of a river with a number of lakelike expansions, and then of an estuary down to the gulf. Between lake Ontario and Montreal there are several rapids, which vessels avoid by means of canals.

The northern shores of the gulf of St. Lawrence are absolutely sterile, but toward the river vegetation becomes abundant and dense forests cover the hills, extending, with occasional intervals on the north shore, to cape Tourmente, near Quebec.

That part of the river between point de Monts and Quebec is known as the lower St. Lawrence, and that between Quebec and Montreal, at the head of the deep-draft ocean navigation, as the St. Lawrence river.

Navigation.—The navigation of the gulf and river St. Lawrence, from the varying tidal streams and currents, the severity of the climate, especially toward the close of the navigable season, and, above all, the frequent fogs, necessitates the exercise of great vigilance, prudence, and ability.

In thick weather continuous soundings are necessary for safety, and when near the land the speed should be slow. Vessels navigating the gulf and river should be provided with a sounding machine, by which deep-water soundings may be obtained accurately and frequently.

Investigations have shown that the strandings in the gulf and river St. Lawrence and the approaches, including the coast of Newfoundland, are owing not to the dangers of the route but to the want of care and attention to navigation.

Magnetic variation.—It must be borne in mind that the magnetic variation differs about 22° between the limits of the places described in this work; thus the variation of Belle Isle will be $35\frac{1}{2}^\circ$, at Quebec $17\frac{1}{2}^\circ$, and at Montreal $13\frac{3}{4}^\circ$ westerly, in the year 1910.

The variation changes particularly rapidly between Belle Isle strait and Anticosti, and the wrecks, which were formerly frequent on the eastern part of Anticosti in foggy weather, were doubtless due to this change not being allowed for.

The variation is decreasing about 2 minutes annually at the strait of Belle Isle; it is nearly stationary at Cape Breton island; and it is increasing about 3 minutes annually at Quebec.

The deviation of the compass should be ascertained when approaching and navigating the gulf, as the large angle of the magnetic dip and the small horizontal force in this region will probably cause the deviation to be different from that determined in other places. This applies to both corrected and uncorrected compasses; the change in a corrected compass being largely dependent on the suitability of the correctors, viz. magnets or soft iron, and in an uncorrected compass on the suitability of its position, as regards the surrounding iron, especially vertical iron.

Local magnetic disturbance.—An opinion is prevalent that the compasses of vessels are locally disturbed in the gulf and river, and such disturbance has been attributed to magnetic ores of iron in the hills, particularly those of the north shore. Magnetic oxide of iron does exist abundantly, and attracts the needle of a compass placed on shore very powerfully at some points, particularly along the shore eastward of Seven Islands bay. Among the Mingan islands the variation was found to vary from this cause from 19° to 31° West. At Portneuf and Manikouagan point the needle was also disturbed. Although it is not possible that the disturbing forces here described can extend to ships navigating off the coasts of the above-mentioned places, areas of disturbances may exist at the bottom of the adjoining seas, producing small disturbances in ships when in shallow water. Actual experiences of this kind have occurred, but they are not common. In deep water—that is, in depths exceeding 50 fathoms—no effect has been observed. Care must be used to prevent accidents from these disturbances.

Ice.—During spring and autumn the navigation of the gulf is rendered difficult by ice, and navigation is entirely closed during the winter. In spring, generally until May and sometimes until early in

June. parts of the gulf are usually covered with drift ice, and vessels are sometimes beset in it for many days. If unprepared for meeting ice they often suffer from it and are occasionally lost, but serious accidents from this cause do not frequently occur, as the ice is then generally more or less in a melting state from the effect of the sun and warmer winds. In autumn, accidents from ice seldom happen, except when winter commences unusually early or when vessels have lingered imprudently late.

Cabot strait is never frozen completely over, but vessels not specially built to encounter ice can not navigate it safely between January and April, inclusive, on account of the heavy drift ice which blocks the strait, more especially when the ice forms the Bridge. Sealing steamers attempt the strait at all times, but are occasionally fast in the ice for days together. There is often difficulty in getting through the inner part of the strait.

The Bridge.—Nearly every year, in the spring, or from about the middle of April to the middle of May, there is a great rush of ice out of the gulf, causing a block between St. Paul island and cape Ray. This block, which sometimes lasts for three weeks and completely prevents the passage of ships, is known as the Bridge. It is recorded that 300 vessels have at one time been detained by this obstacle, and in consequence many wrecks have occurred on the coast of Newfoundland.

Ice from the gulf is generally met with in Cabot strait early in January. At this time it is thin, but it increases gradually to as much as 4 feet in thickness. Occasionally small bergs, some 18 feet in height, are seen, although a large berg is seldom visible. Ice may flow through till May, or even till the beginning of June, according to the season.

A prevalence of northwesterly and northerly winds drives the ice toward the strait and along the west coast of cape Breton, when incoming vessels meet no ice except southwestward of St. Paul island. A southwesterly gale occasionally takes the ice out between Magdalen islands and Cape Breton island, when it meets the main body flowing past Bird rocks and closes the strait between St. Paul island and cape Anguille. Winds between northeast and south open the Newfoundland coast, and the strait often clears quickly with winds between northwest and northeast, so that in about 36 hours very little ice may be visible from cape Ray, but quantities of ice pass through for many days after navigation is open, particularly with northerly winds.

The ice usually passes out of the strait in the direction of Banquereau bank, the eastern edge extending half way between Scatari and St. Pierre island. Its path broadens when through the strait, and

is principally governed by the winds, but under the influence of the current alone the ice drifts southwestward, and in latitude 45° N. may be from 10 to 75 miles in width. Much of this is very heavy, and prevents the passage through it of all vessels not specially built to encounter ice. The coast between cape North and Scatari often holds the ice, during easterly winds, until late in May. Occasionally the ice is drifted along the south coast of Newfoundland and reaches St. Pierre, but no ice was sighted from that island after the middle of April during the seven years 1889–1895.

Gulf of St. Lawrence.—The ice forms in the gulf early in December and being joined by that from the river, is carried by the current toward Cabot strait. The ice increases rapidly during the cold season. It is usually in sheets a mile or two in length with passages between them, although sometimes during a prevalence of southwesterly winds it may form an unbroken sheet for a few days, extending many miles, or even from Cow head to Great Mekattina island. In the eastern part of the gulf ice may be met with as late as the beginning of June.

A portion of the ice setting eastward through the gulf appears to split on cape George: the main part passes into George bay and toward Cabot strait; the other part generally sets east-northeastward, especially in March and April.

The ice which usually enters the gulf through Belle Isle strait early in January, can not at present be followed. It may arrive off Bonne bay during January or February, or it may be driven onto the northern shore of the gulf. Icebergs are rarely found westward of Greenly island, although some have been seen off Natashkwan point. Northwesterly winds close the west coast of Newfoundland, while southwesterly winds open a lane of water inshore. The gulf ice usually clears off the west coast of Newfoundland during the first half of May, but it may remain much later.

The harbors and bays in the gulf begin to freeze in December and are usually closed to navigation at about the end of that month; even in the southern part of the gulf navigation is not considered safe on an average after the first week in December or before April 15.

The gut of Canso and Northumberland strait are rarely closed by ice after April 25.

As a rule, the harbors in the western part of the gulf close earlier and open later than those in the eastern part; each locality is described when necessary in the following chapters.

Small vessels from the harbors on the northern shore of the gulf and the western harbors of Newfoundland, as well as steamers specially constructed for ice navigation, prosecute the seal fishery in the gulf in March and April.

Lower St. Lawrence.—The harbors and bays in the lower parts of the river begin to freeze early in December, and there is heavy ice at the mouth of the river toward the end of that month, which lasts until about the middle of April, but during all the season leads can be found when the wind drives the ice to either side of the river. As a rule, navigation at Quebec is closed by ice from November 26 to April 27, but generally it is considered unsafe after November 15 or before April 25, and even after the latter date vessels are often embarrassed by drift ice, through which, however, steamers can usually force their way.

It is hoped by the employment of ice breaking steamers to extend the period beyond which the river has hitherto been navigable.

Belle Isle strait.—Thin sheet ice makes its appearance in the strait between December 15 and 25, and at about the beginning of the year ice several miles in extent and 3 to 10 feet in thickness passes between the coast of Labrador and Belle Isle and drifts into the strait.

Icebergs do not arrive in any great number until after the commencement of April, but from that time until September (or even October) they are numerous and sometimes very large. The greater number of the bergs enter between Belle Isle and Labrador and pass slowly through the strait, frequently grounding and breaking up, the broken ice drifting toward the northern shore. It is stated that no bergs ever come ashore on the Newfoundland side. In 1898 many bergs were from 150 to 200 feet in height, and some 500 to 600 feet in breadth. Some of the bergs ground, while others change their positions; no berg drawing more than 30 fathoms of water can reach the western end of the strait without breaking up, and only the smaller bergs pass through; these are occasionally seen as far west as Greenly Island and as far south as Rich Point. The bergs are much more numerous in some seasons than in others; 200 bergs and large pieces of ice were counted in the strait in August of one year, whilst only half a dozen could be seen in the following August. With westerly winds, the strait is often clear of bergs. The bergs are a considerable source of danger to shipping during the prevalent thick fogs. In 1898 the bergs kept chiefly on the northern shore of the strait and could generally be avoided by keeping on the opposite side.

After May strings of heavy ice drift in with easterly winds and cause great obstruction, but with light winds these strings do not enter the strait, which may be clear and remain so after April. Between about the 10th and end of June these strings of heavy ice usually fail.

The first steamers enter the strait between June 7 and July 25, and the last pass outward between November 11 and 26.

In 1899 the first steamer passed westward through the strait on June 22; later than this a number of steamers attempted to pass

through, but were compelled, owing to the amount of field ice encountered, to bear up for cape Race and pass southward of Newfoundland.

Caution.—The proximity of ice is indicated by the following signs, and if only one of them is observed caution should be used. Both by day and at night the ice blink is almost always visible on the sky toward the ice. Ice blink is a bright yellowish white light near the horizon, reflected from the snow-covered ice, and seen before the ice itself is visible. The absence of a swell or motion in a fresh breeze is a sign that there is land or ice on the weather side.

The temperature may fall as ice is approached if the ice be to windward, and only at an inconsiderable distance away, but not otherwise. The fall of the temperature of the sea is sometimes a sign, either of a cold current or of the proximity of ice, and although the temperature of the sea has been known even to rise close to ice, frequent observations of the temperature, both of the air and sea, should be taken and considered.

The appearance of herds of seals or flocks of birds far from land is a sign of ice.

The ice cracking or pieces of it falling into the sea makes a noise like breakers or a distant discharge of guns, which may often be heard from a short distance.

As no rule can be laid down for safe navigation, freedom from accidents depends on the vigilance, skill, and caution of the navigator. Vessels should pass to windward of icebergs to avoid the loose ice floating to leeward.

Bay ice is newly frozen ice sufficiently thick to prevent navigation.

Signals respecting ice.—Information as to ice, wind, temperature, and weather indications can be obtained by communicating with any of the Marine signal stations in the gulf and river St. Lawrence.

Information for the guidance of any vessel desiring it, as to the weather, wind, and the movement and condition of the ice in the gulf and river St. Lawrence is specially supplied to the signal stations at Anticosti, Magdalen islands, Meat cove, cape Ray, cape Race, and St. Pierre island, after the beginning of April.

Information for the guidance of the sealing fleet as to wind, weather, and ice in the vicinity of Anticosti, Magdalen islands, Meat cove, St. Paul island, and cape Ray is also supplied to Eskimo point in March.

Fogs occur in the gulf and river during the open or navigable season, and sometimes last several days continuously; they are most frequent in the early part of summer, and seldom fail to accompany an easterly wind of any strength or duration. In October and November the fogs and rain previously attending easterly gales are replaced

by thick snow. During westerly winds fogs are rare and never of long duration.

The above general observations are subject to restriction, according to locality or season. Thus winds between south and west are usually clear-weather winds above Anticosti, but are frequently accompanied with fog in the eastern parts of the gulf. Winds between south and east are almost always accompanied with rain and fog in every part. Northeasterly winds above point de Monts are often easterly or more to the southward in the gulf, changed in direction by the high lands of the south shore, and have therefore generally the same foggy character. The winds here referred to are those of considerable strength and duration.

Moderate and partial fine-weather winds occur without fog in any season and in any locality. In the early part of the navigable season, especially in April and May, northeasterly winds with clear weather are frequent, and they also occur occasionally at other seasons in every part of the gulf and river.

Fogs in easterly gales extend high above the sea, and can not be seen over from a vessel's masthead; at times the land or other objects may be distinguished at the distance of $\frac{1}{2}$ mile or more in daytime. Fogs in calms, especially after strong winds, are frequently so dense as to conceal a vessel within hail, but usually they are not of much height, so that objects at a distance of 50 yards obscured from a person on deck can be seen by a person some 50 feet up the rigging.

When land is visible in foggy weather, estimations of distance are usually in excess of the correct distance. No reliance should be placed upon a position assumed from the distance at which the sound of surf breaking on a rocky shore is heard, but where steep cliffs extend to the sea, the proximity of a steamer to them may be detected by the echo of the whistle, although this can not be trusted. The only safe guide is the constant use of the lead.

Fog signals.—It has been clearly established—

- (1) That fog signals are heard at greatly varying distances.
- (2) That under certain conditions of atmosphere, when a fog signal is a combination of high and low tones, one of the notes may be inaudible.
- (3) That there are occasionally areas round a fog signal in which it is inaudible. Under certain conditions of the atmosphere the sound may be lost at a very short distance from the station, and these conditions may vary within very short intervals of time.
- (4) That a fog may exist at a short distance from a station and not be observable from it, so that the signal will not be sounded.
- (5) That some fog signals can not be started at a moment's notice, although every endeavor is made to sound them as quickly as possible after signs of fog have been observed.

Mariners are therefore warned that the lead should never be neglected. Particular attention should also be given to placing lookout men in positions where the noises of the ship are least likely to interfere with the hearing of the sound of a fog signal, because experience shows that although such a signal may not be heard from the deck or bridge when the engines are moving, it may be heard when the ship is stopped, or from a quiet position. It may also be heard from aloft though not from deck.

It should also be noticed that distances from a fog signal should not be judged from the power of the sound.

Submarine fog bells.—Submarine fog bells have been established at Anticosti lightvessel and the lightvessels in the lower St. Lawrence, and it is proposed to establish others in the St. Lawrence approaches. These bells are submerged in the water to the depth of about 25 feet below a lightvessel, or below a buoy, and a large hammer, operated by compressed air, is caused to strike the bell at intervals during thick or foggy weather. Water being a good conductor of sound, the sound vibrations set up in the water by the bell are caused to operate a microphone immersed in a tank filled with a solution denser than sea water, which is attached to the listening ship's side in the hold at a certain distance above the keel, and fitted with a telephone transmitter. The transmitter, which is adapted for the recognition of sounds of high pitch, is connected to a telephone receiver in the chart house or where convenient. When the sound vibrations from the bell reach the ship, they are imparted to the transmitter and may be heard as a sound in the telephone receiver from a distance of about 5 miles, and the bearing may be determined to within $\frac{1}{4}$ point. In vessels not equipped with the receiving apparatus the bell may perhaps be heard from a position within the vessel with the ear close to the ship's side below the water line, but only from a distance of 1 to 2 miles.

Winds—Weather.—The prevailing winds during the navigable season are either directly up or directly down the estuary, following the course of the high lands on either side of the great valley of the St. Lawrence. Thus, a southeasterly wind in the gulf becomes easterly and northeasterly in the river. Westerly winds do not appear to be so much guided in direction by the high lands, excepting along the southern shore, where a southwesterly wind at Bic island may become a northwesterly wind at cape Gaspé. These winds frequently blow strong for three or four days in succession; the weather with westerly winds being fine, dry, clear, and sunny, and with easterly winds cold, wet, and foggy.

Easterly winds prevail in the spring, and frequently blow for several weeks in succession. Westerly winds become more frequent

toward summer, and southwesterly winds prevail in summer in all parts of the river and gulf. Light southerly winds blow occasionally, but northerly winds are not common in summer. Steady northwesterly winds are not frequent before September, excepting for a few hours at a time, when they generally succeed a calm following easterly winds; they become strong and usually back to the southwest. Northwestern winds are dry, with a bright clear sky, flying clouds, and showers. Toward the end of September, winds from the northward of west become common, and then are often strong steady winds of considerable duration. In October and November, northwesterly winds are frequently violent in heavy squalls, with passing showers of hail and snow, and attended with sharp frost.

Thunderstorms are common in July and August, and last about one or two hours; the wind proceeding from them is generally violent and sudden, particularly when near high land, and sail should be fully and quickly reduced on their approach.

Strong winds seldom veer quickly from one quarter of the compass to the opposite, but generally fall calm, and are followed by a wind in the opposite direction; they may veer, however, several points. Northwestern winds seldom haul through north to east and southeast, but they frequently back by degrees to the southwest, after becoming moderate. Southwesterly winds seldom haul through northwest to the eastward, but sometimes back, through south, to southeast and east.

In the fine weather westerly winds of summer, a fresh breeze often decreases to a light breeze or calm at night, and freshens again from the same quarter on the following morning; it is only under these circumstances that there may be a land breeze off the north shore; a land breeze may also occur off the south shore, but not so strong or extending so far from the land. The north land wind is occasionally carried nearly over to the south shore just before daylight, but the south land wind seldom extends more than 5 or 6 miles off. Under the same circumstances, that is, with a fine weather westerly wind failing with the sun, a southwesterly land breeze frequently blows off the north coast of Anticosti at night and during the early part of the morning. If, however, the weather is not settled fair and the wind does not fail with the sun, it is usually useless to run a vessel close in shore at night in order to obtain a breeze off the land.

In Belle Isle strait the normal direction of the wind is through the strait, that is, either northeast or southwest, notwithstanding the direction of the wind outside. From June to September, 1898, the predominant direction of the wind was southwesterly. In September strong northerly and northwesterly winds were frequent with clear weather.

Gales.—It is unusual for a very heavy gale of wind to occur in the gulf and river St. Lawrence from May to October, although fresh to strong breezes are common. There are, however, years the character of which is decidedly stormy; gales of wind of considerable strength then follow each other in quick succession and from opposite quarters. Also during August and September cyclonic storms, which originate as hurricanes in the West Indies, pass over the Eastern Maritime provinces and are severely felt, certainly as far westward as Ontario.

When, after a continuance of westerly winds and fine weather, the barometer has risen some tenths above 30 inches and begins to fall, an easterly wind may be soon expected. If the barometric fall is accompanied by a warm hazy atmosphere and mirage during the day, and a heavy dew at night, while the stars twinkle brightly, or there is a colored aurora borealis, the approach of southerly or easterly wind is almost certain. At the commencement the southerly or easterly wind is usually light with fine clear weather; but if the barometer continues to fall the wind gradually increases, the sky becomes overcast, rain and fog follow and continue with little intermission until dispersed by a fresh breeze from the contrary quarter.

If the fall of the barometer during the continuance of the southerly or easterly wind be very slow, the gale generally lasts some time and is not violent; if rapid, it is of short duration and of greater strength. When the barometer has fallen to 29 inches the southerly or easterly wind generally falls to a calm and in a short time a northwesterly gale commences. The strength of this succeeding gale is in proportion to the fall of the barometer and to the strength of the southerly or easterly gale which preceded it. A heavy cross sea remains for some time from the previous gale.

The barometer sometimes begins to rise in the interval of calm which precedes the northwest gale; at other times, at its commencement; then the fog and rain cease and the weather becomes quite clear, generally in a few hours, and sometimes almost immediately. The strength of the northwesterly gale is usually greatest soon after the beginning and diminishes as the barometer rises, the wind backing to the southwest. These circumstances are the reverse of those attending an easterly gale, which usually begins with a high barometer and clear weather, and is light at first from the southward or southeastward and gradually increases as it backs to the eastward, with a falling barometer.

If, after a northwesterly gale has backed to the southwest and becomes moderate, the barometer remains steady at a mean height, fine weather usually follows. If it reaches a considerable height but is unsteady, expect variable weather and wind of moderate force. If, on the contrary, it rises quickly to a great height, a repetition of the southerly or easterly gale is probable. In some seasons the barometer

has no sooner risen for one wind than it has begun to fall for another, and this stormy alternation has continued for months; whilst in others there has been scarcely a strong breeze during the whole summer.

Barometer.—The ordinary range of the barometer in the gulf and river St. Lawrence during the navigable season is from 29.00 to 30.50 inches, and its movements generally accompany the changes of the winds and weather.

There is a great difference in the weather in different seasons, but in spring or early summer a northeasterly wind with a rising barometer, although perhaps not for a few hours, will almost always become fine and clear; and if the barometer fall suddenly and greatly at any time, a northerly or probably a northwesterly gale may be expected; it may not be immediate, for it may be preceded by a strong short southwesterly gale, during which the barometer will seldom rise, and may continue to fall, but when the southwesterly gale dies away, the northerly or northwesterly will soon succeed with a rising barometer.

Although a considerable fall of the barometer at times occurs without being followed by a strong wind, so also a strong breeze may arise without any indication from the barometer, but it is unlikely to reach the force of a gale. A gale so heavy as to be of serious consequence to a good vessel does not occur without being indicated by the barometer. It is remarkable that in the gulf and estuary of the St. Lawrence a high barometer is often indicative of a southerly or an easterly gale, and of wet and foggy weather, which usually accompanies its fall, whilst a low barometer is often the precursor of dry weather, which generally follows its rise.

Storm signals.—Storm signals are hoisted at several places on the coasts of Nova Scotia, Cape Breton island, New Brunswick, Prince Edward island, and Quebec, on warning being received from the meteorological office at Toronto, thus:

No. 1. A cone apex down indicates the probability of a gale, at first from an easterly direction.

No. 2. A cone apex up indicates the probability of a gale, at first from a westerly direction.

No. 3. A cylinder over a cone apex down indicates the probability of a heavy gale, at first from an easterly direction.

No. 4. A cone apex up over a cylinder indicates the probability of a heavy gale, at first from a westerly direction.

The night signal corresponding to Nos. 1 and 3 is a red light.

The night signal corresponding to Nos. 2 and 4 is a white light above a red light.

NOTE.—Mariners can obtain further information from signal agents, or by consulting the daily forecasts. It must be borne in mind that the storm signals do not necessarily mean that a storm will

occur at a place where the signal is displayed, but that one is expected, either there or within such a distance that vessels leaving port would be liable to be caught in it.

In a heavy gale the wind has a rate of over 40 miles an hour, and in a moderate gale the rate is less.

The places at which these signals are exhibited are indicated in this book.

Weather forecasts are issued daily from the meteorological office at Toronto. The forecast issued at 10 p. m. is distributed by the telegraph companies to almost every telegraph office in the Dominion, and is published in nearly all the morning newspapers. That issued at 10 a. m., which covers the current and following days, is also widely disseminated and published in most of the afternoon papers, besides being posted in conspicuous places, especially at sea-ports where mariners can conveniently see it.

Currents—Cabot strait.—On the south coast of Newfoundland between St. Pierre island and cape Ray, the current sets northwestward and passes round cape Ray into the gulf. In ordinary weather this inward current is felt for a width of 10 to 15 miles from cape Ray, or even farther. In August at 13 miles westward of that cape its rate varied from $\frac{1}{2}$ mile to nearly $1\frac{1}{2}$ miles an hour. This current is by no means constant.

On the western side of Cabot strait to about 12 miles eastward of St. Paul island, there is a constant current setting between south and southeast; its rate is usually from $\frac{1}{2}$ mile to $1\frac{1}{2}$ miles an hour, but after a strong northwesterly wind it has reached a rate of $2\frac{1}{4}$ miles. It may, also, be checked or reversed for a few days at a time by strong southeasterly winds. Its greatest rate is off cape North, where it may be as much as 2 miles an hour in ordinary weather. Sometimes it extends nearly across the strait.

This current continues to be felt along the eastern coast of Cape Breton island, sometimes as far as Scatari island. It is probably affected by the tidal streams, accelerated by the ebb and retarded by the flood. In the middle of Cabot strait the current is variable and usually weak.

Belle Isle strait.—The movement of the water in Belle Isle strait is tidal, but a strong wind through the strait either way makes a drift, which causes the opposing tidal stream to slacken and eventually overcomes it altogether: a continuous current then runs in the direction toward which the wind is blowing, but its rate increases or decreases according as the tidal stream is with or against it. This appears to take place earlier on the Labrador side of the strait than on the Newfoundland side, which is more under tidal influence.

The general Arctic current setting southward past the Atlantic mouth of the strait is influenced by the tidal inflow and outflow of the

strait itself; the greater inflow toward the strait takes place on the northern side of the entrance, and the greater outflow on the southern side.

Gulf of St. Lawrence.—The rate of the current in most of the open area of the gulf of St. Lawrence seldom exceeds 1 mile an hour; its direction, therefore, is very variable, being easily influenced by strong winds, and on this account it is necessary to exercise caution in navigation.

Westward of a line drawn from Southwest point, Anticosti, to about 12 miles eastward of St. Paul island, there is usually a current setting south-southeastward at a rate of $\frac{1}{2}$ mile to 1 mile an hour; but occasionally it is reversed, when its rate is only about $\frac{1}{2}$ mile, or it may run northeastward or southwestward as a cross current at a rate of $\frac{1}{2}$ mile to 1 mile.

A large portion of the water from the St. Lawrence turns southward round cape Gaspé and finds its way eastward between Magdalen islands and Prince Edward island.

Generally on the west coast of Newfoundland, the current sets northeastward; it is scarcely appreciable from cape St. George to Bay of Islands, but thence to Rich point it may be considered constant, with a rate of about 1 mile an hour; it is stronger near the land than farther out, and in the vicinity of bays and inlets this current is deflected by the inset and outset of the tidal streams. It is stronger than usual for some hours before a southwesterly wind commences, but a strong northeasterly wind causes it to slacken and even turn southwestward.

In the area between a line drawn from Rich point northward to Eskimo islands and the western end of Belle Isle strait, the currents are variable and uncertain, being intermediate between the above current and the tidal streams of the strait. In the western part of this area the rate is usually less than 1 mile and rarely over $1\frac{1}{2}$ miles, but toward the entrance of the strait it increases. In the offing of Eskimo islands the stream usually sets along the land in either direction, but at times it sets off and on shore for a whole tide. A current sometimes runs southeastward from the vicinity of Greenly island and sets strongly on the shore about Flower cove.

On the northern shore of the gulf from Eskimo islands to cape Whittle, in calms or easterly winds, the general movement of the water is westward, but in westerly winds it is very variable. Between cape Whittle and Heath point, the currents are weak and affected by the wind.

There is no general through current in the channel northward of Anticosti. It is probable that the surface current at the eastern end of the channel usually sets southeastward with little strength, but it is influenced by the wind.

Any set there may be northward of the line joining West point, Anticosti, and point de Monts appears to be caused by the wind. At times an eddy current sweeps round the bay from Seven islands to point de Monts; this eddy sets southward from about Egg island.

On the south coast of Anticosti the currents are usually weak and irregular, setting on and off shore as much as in other directions. It is stated by local fishermen that the current sets northward and obliquely onshore on both sides of South point, more especially with southwesterly or southerly winds and a rising tide.

Lower St. Lawrence.—The current is strongest in the estuary of the St. Lawrence in spring, soon after the opening of navigation, when the river is swollen by the melting snow.

Below Father point a constant down-going surface current follows the southern shore of the estuary, and usually occupies about half the width of the river above cape Chat. It runs strongly along the northern edge of the bank of soundings off the southern shore, and the boundary between it and the inshore flood tidal stream is marked by a strong ripple. From Father point to Fame point the rate of this down-going current is about 1 to $2\frac{1}{2}$ miles an hour, according to the tide, direction of the winds, and the season of the year. Between Fame point and cape Gaspé it sets almost constantly east-southeast and southeast, generally at a rate of 1 to 2 miles an hour, the greatest rate observed being $2\frac{3}{4}$ miles an hour. It usually occupies a belt of about 12 miles in width, lying 2 to 14 miles offshore in the vicinity of Fame point. This belt appears to become narrower and the current stronger toward cape Rosier. In passing cape Gaspé the current keeps closer to the land, cutting off the inshore tidal stream, and its direction there varies from southeast to south. This current past cape Gaspé is constant during very varying conditions of the current elsewhere.

The main current setting southeastward appears at times to lie in the middle of the passage between the land from cape Magdalen to cape Gaspé and Anticosti island. It, however, does not appear to be felt on the Anticosti side. When the current is in this position, the area between it and the Gaspé coast may be occupied by weak and variable currents, or a reverse current may set inwards to the northwest. Such a current may occupy a belt lying 2 to 12 miles off Fame point, and may run constantly northwestward for some six days at a rate of $\frac{1}{2}$ mile to $1\frac{1}{2}$ miles an hour. During this time the current past cape Gaspé still runs southward, and its general direction is a little southward of south-southeast.

When the above changes occur the current may turn in direction, and set on or off shore for 2 to 4 hours at a time with a rate of $\frac{1}{2}$ mile to $1\frac{1}{2}$ miles an hour. This has been observed both on the Gaspé side of the estuary, southeastward of Fame point, and on the Anticosti

side, between Southwest point and West point, at distances of 4 to 7 miles offshore.

The current is always affected by the tidal stream. When the current has its usual southeasterly direction it is strongest at low water and weakest at high water, but when the current runs inwards the reverse is the case.

It seems probable that the chief reason that the current keeps along the Gaspé coast is because the prevailing winds on the lower St. Lawrence are from the northwestward. When the winds are northwesterly in the Gaspé region also, they assist in keeping the current on that shore and in increasing its rate. In general, mariners may expect to find the usual down-going current setting southeastward along the Gaspé coast, unless they have reason to infer from the weather met with, that a low-pressure area, or storm center, is passing to the northward. This is commonly accompanied by winds from the southward of west in the lower St. Lawrence, and southerly winds with a falling or low barometer southward of Anticosti. The condition of the current may then be disturbed as above explained.

Under these disturbed conditions there are times when the current sets more or less onshore.

The down-going current is constant or nearly so round point de Monts; this point turns the current to the southeastward at a rate of 1 to 2 miles an hour, and it must be guarded against when beating up the estuary and in this vicinity, especially in foggy weather.

Tides.—The tidal undulations enter the gulf of St. Lawrence by Cabot and Belle Isle straits. The wave entering by Cabot strait reaches a line drawn approximately from St. Paul island to La Poile bay, Newfoundland, at about 8h. Quebec mean time, full and change, and by 9h. it has advanced to a line drawn from the vicinity of Bird rocks to Bear head, Newfoundland. The wave entering Belle Isle strait reaches at 9h. Quebec mean time, full and change, a line curving westward from about cape Diable to Eddies cove. Both waves meet at 10h. Quebec mean time on about a line drawn spirally from the vicinity of Bird rocks to Fog island, on the north shore of the gulf, and thus over a large area in the eastern part of the gulf high water occurs nearly at the same time, or from 9h. to 10h. Quebec mean time.

After meeting, the two undulations are deflected northward and southward of Anticosti, the northern producing high water in the channel northward of that island. The undulation passing southward of Anticosti follows the deep channel into the lower St. Lawrence with considerable velocity, reaching a line curving westward between point de Monts and cape Michaux at 12h. Quebec mean time. Lateral waves extend off this undulation, the northern of which causes high water on the southern coast of Anticosti, and the southern travels southwestward, southward, and southeastward between Mag-

dalen islands and Gaspé peninsula, the eastern coast of New Brunswick, and Prince Edward island, reaching lines drawn approximately from Grindstone island to cape Gaspé at 2h.; from Grindstone island to North point, Prince Edward island, at 4h.; and from Entry island to East point, Prince Edward island, at about 8h. Quebec mean time.

The undulation which causes high water at St. Paul island at about 8h., also causes high water between East point, Prince Edward island, and the vicinity of cape Mabou, Cape Breton island, at about the same time, and it thence advances westward in Northumberland strait. The wave traveling southwestward between Magdalen islands and cape Gaspé, as above described, reaches the northwestern entrance of the strait at about 3h. Quebec mean time, and it turns southeastward into the strait; these waves meet westward of cape Tormentine.

The greatest range of the tide in the gulf is attained at Charlottetown and at the head of Chaleur bay, where it amounts to about 10 feet.

At the entrance of St. Lawrence estuary the tide has a range of 6 to 8 feet, and the range increases as the river is ascended. The maximum range of 19 feet is attained at Grosse isle; at Quebec, 25 miles farther up, the range is 18 feet, but at 40 miles above Quebec the tide is to a large extent cut off by Richelieu rapids, and it ceases to be felt at Three Rivers, at the lower end of lake St. Peter.

Tide tables are issued annually by the tidal survey branch of the Department of Marine and Fisheries of the Dominion of Canada for Quebec and Father point, with tidal differences for the gulf and river St. Lawrence, and data for the turn of the tidal streams throughout the lower St. Lawrence; for Ste. Croix bar, above Quebec; and for Charlottetown, Pictou, and St. Paul island, with tidal differences for Northumberland strait, Miramichi, the north coast of Prince Edward island, and Cabot strait.

Tide tables for the gulf and river St. Lawrence are also issued by the United States Coast and Geodetic Survey.

Tidal streams.—Throughout the gulf the currents are affected by the tidal streams, being accelerated when the stream is running in the same direction as the current, and retarded, or even reversed, when the stream is opposing the current. The direction of a current also may turn with more or less regularity in accordance with the tidal stream.

The rate of the tidal stream in the lower St. Lawrence is sometimes 5 to 6 knots an hour; in the gut of Canso as much as 4 knots; and in the narrowest part of Northumberland strait, off Indian rocks and cape Jourimain, 3 knots.

At about 6 miles off the northern end of Magdalen islands the tidal streams run alternately northwestward and southeastward at a rate of over 1 knot an hour.

The influence of the tidal stream from Chaleur bay is felt as far as 30 miles seaward of Miscou island.

In the channel northward of Anticosti, between North point and Niapisca island, the streams are tidal, the west-going stream running during the rising tide and the east-going during the falling tide. The rate at neaps is less than $1\frac{1}{2}$ knots an hour, and the west-going or inward stream is probably $\frac{1}{4}$ stronger than the outward.

The tidal streams near the shore, between Anticosti and point de Monts, although weak, are tolerably regular; from Seven islands to point de Monts the flood stream is stronger than the ebb, the latter being turned to the southward by the point.

Belle Isle strait.—The movement of the water in Belle Isle strait is predominately tidal. When uninfluenced by wind the stream runs northeast and southwest for nearly equal periods, and turns regularly in accordance with the rise and fall of the tide. On the whole, the southwesterly, or inward, flow seems to be slightly greater than the outward flow.

It appears as yet impossible to predict with accuracy the direction of the streams in the strait, but under normal conditions the southwest stream begins about 4 hours before high water at Forteau bay, and the northeast stream about $2\frac{1}{2}$ hours after high water there; the streams turning in direction with the hands of a watch. The ordinary rate during the strength of the streams is 1 to 2 knots an hour, but the greatest rates observed have been, of the southwest stream, $3\frac{1}{4}$ knots, and of the northeast, $2\frac{1}{2}$ knots. Both their rates and directions are greatly affected by any strong winds blowing at the time, or just previously.

On the Labrador side the southwest stream predominates, especially toward the eastern end of the strait, and near the shore, where it is so strong at times as to prevent fishermen hauling their nets.

On the Newfoundland side toward cape Norman the reverse appears to be the case. Certainly there is more slack water in that locality than on the Labrador coast. The northeast stream runs round cape Norman with considerable strength, while the southwest stream is comparatively weak. The streams do not always run fairly through the strait, and with both there is an indraft toward Cook and Pistolet bays.

Lower St. Lawrence.—The flood tidal undulation ascends the lower St. Lawrence in the wide deep water until it arrives at the comparatively narrow pass formed by Green island, Red Islet bank, and the extensive shoals off the entrance of Saguenay river; here it is

obstructed, and a part of it being turned back, forms an eddy flood stream setting from below Red Islet bank toward Razade islets, as shown by the arrows on chart No. 1490. During the ebb tide the stream from the Saguenay sets over to the southward and takes the same direction. Therefore, from the mouth of the Saguenay to cape Chat there is a constant downward stream, which occupies more than half the width of the river on its southern side, its rate being about $1\frac{1}{2}$ to $2\frac{1}{2}$ knots an hour. A short distance below Red Islet bank the stream is very strong, about 4 knots, but its rate decreases to the eastward, where its direction is toward Razade islets, off which its rate is 2 to 3 knots.

During the ebb the stream runs downward on both sides of the estuary, stronger on the south than on the north shore, and weakest in the middle. That on the north side is deflected southward by Mille Vaches, Bersimis, Manikuagan, and de Monts points, and by the ebbing streams of the large rivers between them. This southerly set must be allowed for, especially in sailing vessels with a northerly wind, to prevent being set upon a lee shore.

There is no upward or flood tidal stream along the southern shore of the estuary from cape Gaspé to a few miles below Red islet, except southward of the downward current, and closer inshore than vessels usually venture to go, or within about 1 to $1\frac{1}{2}$ miles off the land.

During the flood there is usually slack water northward of the downward current, whilst along the north shore the flood stream is regular in its recurrence, its rate increasing as the estuary is ascended. The rate of the flood stream is greatest along the north shore, and it diminishes to the southward till at about 9 miles from that shore it is imperceptible. These differences in the rates and directions of the streams produce strong ripples in many places, the positions of which vary according to the times of the tide, and perhaps from the force and direction of the wind.

Round point de Monts there is little or no flood stream excepting very close inshore.

Both flood and ebb tidal streams run from above Red islet to cape à la Roche over the whole breadth of the river.

Lights.—The lights on the eastern coast of Nova Scotia and those required for the winter passage of either steamers or ice boats to Prince Edward island are exhibited all the year. All other lights of the Dominion of Canada under the control of the Department of Marine and Fisheries are maintained in operation whenever navigation in the vicinity is open. Lights used solely as harbor lights are not exhibited when the harbor is closed, although the general navigation may remain open. Fishing lights are maintained only during the fishing season. In any case where there is reasonable doubt whether the light is required it is kept in operation.

Prince Shoal, Red Islet, White Islet, and Anticosti lightvessels are placed in position each spring as early as the ice permits. The lightvessels in the river leave their stations on November 15, annually, and Anticosti lightvessel is withdrawn for the winter at about the same time.

Acetylene gas has been introduced for some of the lightbuoys in river St. Lawrence.

Lightvessels—Riding lights—Numbers.—There is no uniformity of practice in regard to Canadian lightvessels carrying riding lights.

For the purpose of identification all Canadian lightships will hereafter be numbered on a system already established. These numbers will be kept by the several vessels unchanged, even if they change their stations. The numbers allotted are as follows:

No.	Present station.	No. in Canadian List of Lights.
1	Barrington.....	241
2	Miramichi.....	869
3	Red islet.....	1107
4	Upper Traverse (not now in use).....	
5	White Island reef.....	1142
6	Pointe à la Garde.....	963
7	Prince shoal.....	1109
10	Lake St. Peter, west.....	1339
11	Lake St. Louis, east.....	1506
12	Lake St. Louis, center.....	1508
13	Lake St. Louis, west.....	1512
14	Lurcher.....	198
15	Anticosti.....	1040
16	Fraser River.....	2309

Hereafter the number of each vessel is to be painted in white on her topsides in addition to the name of her station.

Buoyage.—The following system of buoyage is adopted in the waters of the Dominion of Canada:

Approaching from seaward all buoys on the starboard side of the channel are painted red, and, if numbered, marked with even numbers, and must be left on the starboard hand.

Approaching from seaward all buoys on the port side of the channel are painted black and, if numbered, marked with odd numbers, and must be left on the port hand.

Numbers, when used, are in consecutive order, commencing from seaward.

Buoys painted red and black in horizontal bands mark middle grounds and are left on either hand.

Buoys painted white and black in vertical stripes mark mid-channel, or the fairway, and may be passed on either hand. These buoys are rarely used.

Pillar, light, bell, and whistle buoys mark special positions, a detailed description of which is given when the mark is first established.

Conical buoys, when used, are always on the starboard side of the channel; conical topmarks on starboard hand buoys, and cylindrical topmarks on port hand buoys; otherwise the shapes of buoys have no special significance at present.

The rule for coloring buoys is also applicable to beacons and other day marks, so far as it may be practicable to carry it out.

The buoys in the lower St. Lawrence are numbered consecutively from Gaspé westward, and also bear the letter B (Below Quebec).

Buoys in the river St. Lawrence above Quebec are numbered under letters of the district, thus: Q, Quebec; C, Champlain; L, Lake, including lake St. Peter, and M, Montreal.

The spar buoys in the river are swift current buoys, ballasted with iron rings to keep them upright.

Caution.—Buoys marking outlying dangers, owing to their exposed positions, are always liable to break adrift or to other accident; therefore implicit reliance should not be placed on their being in position.

Buoyage season.—Buoys in the Dominion are, generally speaking, maintained in position during the season of navigation. In localities where the lights are maintained in operation throughout the year the buoys are always kept in position. In districts where navigation is closed in winter the buoys are kept out in autumn until the last vessel has cleared, or as late as the ice will allow, with due regard to their safety. The buoys are replaced in the spring as soon as the ice will permit.

All the buoys, including the lightbuoys, in the lower St. Lawrence between Gaspé and Quebec are placed in position as early as possible after the ice passes down each spring, and are removed after the 10th of November each autumn, the date varying with the season, and every effort is made to leave them out so long as the state of the ice permits, but belated vessels must not expect to find them in position after the ice has begun to run. Some of the more important buoys, if lifted before the last vessels have passed out, are temporarily replaced by wooden spars, in which case the pilots are duly notified, but no special notices to mariners describing the removal or replacing of buoys each season are issued.

The buoys, including the lightbuoys, in the river St. Lawrence between Quebec and Montreal are maintained in position during the season of navigation.

All the bell buoys and whistling buoys on the southeast and east coasts of Nova Scotia from Pennant point, westward of Halifax, to cape North, Cape Breton island, are always maintained, with the following exceptions:

Cape Breaker bell buoy, Grime rock whistling buoy, Louisburg whistling buoy, and Louisburg bell buoy are replaced during winter

by wooden spar buoys, colored according to the Canadian system. Canso Harbor bell buoy, Fourchu bell buoy, and Aconi Point whistling buoy are taken up during winter.

Should heavy gulf ice appear on the coast, it may become necessary temporarily to lift the remaining buoys to prevent their loss.

Wrecks.—Buoys, and the top sides of vessels used for marking wrecks, are painted green with a white inscription, and moored, when possible, near the side of the wreck next to mid-channel.

Wreck-marking vessels exhibit:

By day.—Three balls from a yard, 20 feet above the sea; two placed vertically on the side that shipping may safely pass, and one on the other side.

By night.—Three fixed white lights, similarly arranged; the ordinary riding light is not shown.

Mariners must pass on that side of a wreck-marking vessel on which the two balls or two lights are shown.

Marine signal stations.—The following stations in the gulf and river St. Lawrence are maintained by the government of the Dominion of Canada:

In Newfoundland—cape Ray.

St. Paul island.

In Cape Breton island—Low point (Flat point); Meat cove, cape St. Lawrence.

In Magdalen islands—Amherst island, Grosse isle.

In Anticosti island—Heath point, South point, Southwest point, West point.

On the coast of New Brunswick—point Escuminac.

On the Gaspé coast—point Maquereau, cape Espoir.

In the strait of Belle isle—Chateau bay, Belle isle, Amour point.

On the north shore of the river St. Lawrence—point de Monts, Manikouagan point, Portneuf.

On the south shore of the river St. Lawrence—cape Rosier, Fame point, cape Magdalen, Martin river, cape Chat, Matane, Little Metis, Father point, rivière du Loup, l'Islet.

All inward-bound vessels making their official numbers to any of the marine signal stations in the gulf and river St. Lawrence are reported immediately, and all reports are promptly posted on the bulletin board of the Great North Western Telegraph company's office, Quebec, and on that of the Board of Trade, Montreal. These reports are repeated to the pilot station at Father point, so that pilots may be aware of the locality of inward-bound vessels.

The International Code of Signals is used for communicating with these stations. (Arrangements for night signals are under consideration.)

Dispatches to or from vessels are duly delivered as addressed, and they are charged for at the ordinary telegraph rates between stations; but no charge is made for signaling between coast stations and vessels at sea. Dispatches may, by special request, be delivered in cipher; otherwise they are transmitted in ordinary language.

Vessels may obtain information as to winds, weather, ice, and fisheries at any signal station within the river and gulf of St. Lawrence free of charge.

There are also several telegraph stations on the shores of the gulf and river which are not signal stations; the principal of these are mentioned in the following chapters.

Lloyd's signal stations.—The following of the above signal stations are included in Lloyd's system of reporting stations. Orders forwarded to Lloyd's can be notified to vessels through these signal stations on the same conditions as through Lloyd's signal stations. Vessels signaling to them are reported to Lloyd's for insertion in Lloyd's List, the Shipping Gazette, and daily press, in the same manner as if reported from Lloyd's signal stations:

Cape Ray; St. Paul island; cape St. Lawrence; Amherst island; Heath point, South point, Southwest point, and West point, Anticosti; Chateau bay; Belle isle; Armour point; cape Rosier; Fame point; cape Magdalen.

Wireless telegraph stations are established and maintained by the government of Canada as follows:

Stations.	Call letters.	Remarks.
Fame Point lighthouse, Gaspé coast.....	FP	These stations have a normal range of 125 miles and are available, day and night, for communication with vessels equipped with a Mareoni apparatus.
Heath Point lighthouse, Anticosti.....	HP	
Cape Whittle, Labrador.....	WR	
Point Rich lighthouse, west coast of Newfoundland.	TC	
Cape Ray lighthouse, southwest point of Newfoundland.	CR	
Cape Sable lighthouse, southwest point of Nova Scotia.	SB	
Partridge Island lighthouse, St. John harbor, New Brunswick.	SJ	
Clark city, Seven islands, northern shore of St. Lawrence river.	CK	
Father Point lighthouse, southern shore of St. Lawrence river.	RT	
Point Amur lighthouse, Labrador.....	PR	These stations have a normal range of 60 miles and are available, day and night, for communication with vessels equipped with a Marconi apparatus.
Belle Isle lighthouse, southeast end of the island....	BL	
Cape Race lighthouse, southeast point of Newfoundland.	CE	
North Sydney, entrance to Sydney harbor, Nova Scotia.	ND	
Cape Bear lighthouse, southern end of Prince Edward island.	BE	These stations have a normal range of 60 miles, but are in operation only during the winter months for communication with steamers crossing from Prince Edward island to the mainland and are not available for commercial purposes.
Pictou, Nova Scotia.....	RU	
Sable island, Atlantic ocean.....	SD	These stations are operated by the Marconi Wireless Telegraph Company of Canada (Limited) and are available, day and night, for communication with vessels equipped with a Marconi apparatus.
Camperdown heights, entrance to Halifax harbor, Nova Scotia.	CN	

Commercial and social telegrams are accepted at any of the Canadian Pacific Telegraph offices in Canada, and are sent prepaid to steamers equipped with wireless telegraph apparatus at a minimum charge of \$2 for ten words, and 12 cents for each additional word, besides the usual land charges.

Telegraph cables.—Seven cables from England and Ireland touch at Canso, whence five cables run to United States ports, one to St. Pierre island, one to Sydney, and one to Port Basque.

Two cables are laid from Sydney to Placentia bay, Newfoundland, and one to St. Pierre island.

A cable runs from Cape Breton island to St. Paul island, and another to Magdalen islands, which is continued to Bryon island.

Prince Edward island is connected by a cable with the mainland.

Anticosti is connected by cables, one from the Gaspé coast, one across Mingan channel, and one from Bryon island to Heath point.

On the north shore of the estuary a cable crosses Saguenay river.

A cable also connects Chateau bay and Belle isle.

Coal.—Coal can be obtained in large quantities at North Sydney, Sydney, Pictou, Charlottetown, Quebec, and Montreal; quantities of 500 to 1,000 tons are usually in stock at Cow bay, Louisburg, Georgetown, Summerside, and Chatham.

Docks.—The harbor commissioner's dock at Quebec is 600 feet long over all, 61½ feet wide at the entrance, with 23¼ feet on the blocks at high water ordinary springs.

There are also three small floating docks at Quebec.

At Montreal there are two docks 360 feet and 300 feet long, respectively.

There are marine railways at Pictou, Port Hawkesbury, and North Sydney.

Repairs.—Ordinary repairs to iron vessels and machinery can be effected at North Sydney, New Glasgow, Pictou, Charlottetown, Quebec, and Montreal.

Marine hospitals.—A duty of 2 cents per ton register is levied on every vessel arriving in any port of the provinces of Quebec, Nova Scotia, New Brunswick, and Prince Edward island: the money thus collected forming a sick mariners' fund. Vessels of 100 tons and less pay the duty once a year, and vessels over 100 tons three times in each year.

No dues are collected from vessels in the province of Ontario, but an appropriation is made by Parliament to cover the expenditure at Kingston and St. Catharines, where general hospitals are established and sick seamen are cared for at a rate of 90 cents per diem.

At Montreal sick seamen are cared for at the General hospital and at Notre Dame hospital; at Quebec at the Jeffrey Hale and the Hotel

Dieu hospitals. Marine hospitals are maintained in Nova Scotia at Pictou, Sydney, and point Tupper; in New Brunswick at Miramichi, Richibucto, and Bathurst, and in Prince Edward island sick seamen are cared for at the Charlottetown and Prince Edward Island hospitals.

At ports where no hospitals are established sick seamen are cared for under the chief officer of customs, when the vessel to which the seamen belong has paid the dues.

Pilots.—Pilotage for the lower St. Lawrence is controlled by the Canadian Department of Marine and Fisheries and is compulsory for merchant vessels in the river St. Lawrence. The pilots are embarked by inward bound vessels and disembarked by outward bound vessels at Father point.

The pilotage district is included between a line drawn from Father point to the eastern anchorage ground at cape Colombier and the city of Quebec. It includes the Saguenay river.

Nova Scotia banks.—Proceeding to the gulf of St. Lawrence through the gut of Canso the banks which lie off the much-exposed and dangerous coast of Nova Scotia must be crossed. The northeastern edge of these banks runs approximately from St. Paul island to latitude $44^{\circ} 30' N.$, longitude $57^{\circ} 05' E.$, whence the southern edge takes a general southwesterly direction. Of these banks the principal in extent and most important in position are the Banquereau and Sable Island banks, the former being the eastern of what may be correctly designated the Nova Scotia banks.

Soundings have not been obtained on the banks in sufficient numbers to justify much confidence being placed in a position assumed from depths alone.

The shoalest parts of the northeastern of these banks, which are separated from each other by depths usually less than 100 fathoms, but which reach 180 fathoms, are—

Banquereau bank, extending from about latitude $44^{\circ} 30' N.$, longitude $57^{\circ} 17' W.$, westward to the meridian of $60^{\circ} W.$, a distance of about 120 miles, with a greatest width of some 45 miles, is a plateau of sand, gravel, and shells, with 13 to 50 fathoms water; and it may be distinguished from contiguous banks by the numerous flat sea eggs without prickles, which are found on its bottom. The shoalest part of Banquereau bank, with 13 fathoms, in latitude $44^{\circ} 46' N.$ and longitude $57^{\circ} 38' W.$, is the apex of a ridge, having less than 30 fathoms water, about 45 miles in length north-northeast and south-southwest, and some 12 miles in width. Banquereau bank is separated from bank St. Pierre of the Great bank of Newfoundland by a deep channel, nearly 60 miles wide, with general depths of over 200 fathoms, muddy bottom; and from the northeast bar of Sable island

by the Gully, which is 8 miles across its narrowest part and 60 to 340 fathoms deep.

By referring to the chart it will be seen that the above-mentioned ridge, relatively with the dangers of Sable island, is a safe offing for vessels intending to pass to the northward of Sable island, and if the vessels can keep to the parallel of the bank, the continuous line of comparatively shoal water will enable them, under ordinary circumstances, to feel their way with some degree of confidence until they have passed to the westward of Sable island.

There are two shoal spots to the eastward of Banquereau bank, the northern one having from 30 to 40 fathoms of water on it, and the southern one 38 fathoms. These shoal spots are indicated on H. O. chart No. 981 and on B. A. chart No. 2666.

The cable steamer Mackay-Bennett, in 1904, obtained a sounding of 29 fathoms in approximately latitude $44^{\circ} 43' 45''$ N., longitude $57^{\circ} 25' 00''$ W.

Misaine bank lies to the northward of Banquereau bank between it and Scatari island, and is separated from Banquereau bank by a deep-water gully, where the soundings vary from 50 to 155 fathoms.

The least water yet found on this bank is 36 fathoms, on its southeastern side, the general depth being over 40 fathoms, with a bottom of stones and broken shells. The outline of the bank is very irregular; its eastern limit being in $45^{\circ} 28'$ N., $58^{\circ} 10'$ W., and its western extremity being connected with Canso bank by the 60-fathom line. Between Misaine bank and the bank extending from Cape Breton island, there is a deep gully, some 25 miles wide, with a depth of 70 to 162 fathoms.

The northeastern part of Misaine bank is formed of two shoals separated from the main bank and from each other by gullies having depths of 50 to 90 fathoms.

Canso bank.—The northwestern end of this bank lies about 16 miles southeastward of cape Canso, and its eastern side is separated from Misaine bank by a space about 17 miles across, in which are depths of 54 to 79 fathoms, and some patches of 46 to 49 fathoms.

The least water on Canso bank, which extends about 30 miles east and west and some 18 miles north and south, is 35 fathoms, sandy bottom. Its southern side is of very irregular shape. The bank is separated from the northeastern end of Middle bank by a space of deep water with 100 to 180 fathoms, and from the bank extending from cape Canso by a narrow deep-water channel with 50 to 84 fathoms.

Artimon bank, situated at the eastern end of the deep-water gully separating Misaine and Banquereau banks, is of small extent,

the least water being 36 fathoms, over a bottom of stones with star fish and sea eggs.

NOTE.—For Sable island and the Nova Scotia banks southwestward of Canso and Banquereau banks, and also the Great bank of Newfoundland, which extends southward and southeastward of that island, see Sailing Directions for the Bay of Fundy, Southeast Coast of Nova Scotia. The Great bank of Newfoundland is also described in Newfoundland and the Coast of Labrador.

THE GULF AND RIVER ST. LAWRENCE—GENERAL DIRECTIONS.

Entrance.—The gulf of St. Lawrence may be entered from the northward through the strait of Belle Isle, from the southward and from the eastward through the gut of Canso or through Cabot strait.

Those intending to use the gut of Canso must be cautious in passing Sable island. Those using Cabot strait may cross the banks off the coast of Nova Scotia or pass between those and St. Pierre bank, the western one of the Great banks.

General directions—Steam vessels—Cabot strait.—Steam vessels proceeding through Cabot strait, in the spring and with clear weather, should pass the signal station on Galantry head, St. Pierre island, within signaling distance, and obtain information as to the state of the ice; or failing this, obtain the information either from the signal station on cape Ray with northerly winds, or that on St. Paul island under other circumstances. After the ice has disappeared, generally about the end of May, keep farther off Galantry head, to avoid the dense fogs that prevail in that neighborhood during June and July, and beware of the strong current that occasionally sets into the bays on the south coast of Newfoundland; in fact, during this period, it is better to be nearer St. Paul island than cape Ray.

Cabot strait to St. Lawrence river—Southward of Anticosti island.—From Cabot strait steer to pass northward of Bird rocks and thence to cape Rosier. In thick weather the best guide is the deep gut running up the gulf toward the river, and vessels should keep on the edge of the 100-fathom curve, which runs nearly straight from Bird rocks to Cape Rosier. From cape Rosier keep a moderate distance off the south shore of the estuary until abreast Father point.

Caution.—The south shore of the estuary between cape Rosier and Matane is very bold, and there is a depth of 50 fathoms within 3 miles, while the 30-fathom curve is less than 2 miles offshore. Several inward bound vessels have stranded in the vicinity of Matane, owing to their courses having been altered to port, on the assumption that they were above Matane, when they were actually several miles eastward of it.

Mariners are reminded that when the position is not constantly obtained by bearings or angles, it is necessary to make full allowance

for the strong current which invariably sets downstream, regardless of the tidal direction, but with a rate varying according to the rising and falling of the water; increasing during the ebb and decreasing during the flood. In thick weather be careful to give the southern shore a good berth, which can safely be done, as the estuary is clear and open for a width of about 21 miles as far up as Bic island. Hugging the southern shore is incurring an unnecessary risk.

The lead should be constantly used and depths obtained of at least 50 fathoms, no bottom at each cast.

St. Lawrence river to Cabot strait.—From abreast Father point keep a sufficient distance from the south shore of the estuary to obtain the advantage of the downward current. When off Fame point steer for a position northeastward of Bird rocks. Thence make a straight course through Cabot strait, passing St. Paul island as convenient.

In thick weather great caution and attention to the soundings and set of the tidal streams and currents are necessary. From off cape Rosier keep on the edge of the 100-fathom curve, which passes about 12 miles northeastward of Bird rocks. Thence make a direct course through Cabot strait.

Strait of Belle isle to St. Lawrence river—Passage south of Anticosti island.—In approaching Belle isle from the eastward make its southern side, then keep in the fairway of the strait. From Amour point, with clear weather, steer for Anticosti lightvessel, moored 8 miles southeastward of Heath point, and pass her at a moderate distance. Then give the land on the southeast and south coasts of Anticosti a berth of about 5 miles till southward of South Point lighthouse, whence steer for a position northward of cape Magdalen.

In thick weather, from the strait of Belle Isle steer for Anticosti lightvessel in order to pick up her fog signal, using proper caution when approaching the southeastern end of Anticosti; from the lightvessel steer for a position southward of South cape, and thence to a position northward of cape Magdalen. If uncertain as to the position do not cross over the bank extending southeastward of Anticosti in a depth of less than 50 fathoms. Having crossed this bank, and increased the depth to over 100 fathoms, alter course toward a position northward of cape Magdalen. Soundings must be constantly obtained, or depths of at least 100 fathoms, no bottom reached at each cast.

In favorable weather steamers sometimes use the route northward of Anticosti.

Caution.—From the character of the current in Belle Isle strait a vessel passing through it in either direction may overrun her reckoning or the contrary.

When navigation between the strait and the eastern end of Anticosti, it must not be assumed that the current is always setting westward, as it sometimes sets in the opposite direction.

St. Lawrence river to Belle Isle strait.—Proceed down the river at a moderate distance from the south shore to obtain the advantage of the downward current, and from a position off Fame point steer to make South Point lighthouse or light, passing about 5 miles southward of it. Thence steer to pass a similar distance off Heath point, and, leaving Anticosti lightvessel about 3 miles to the southeastward, direct to the strait. In thick weather special attention must be given to the current and tidal streams, the lead must be constantly used, and the southeastern end of Anticosti should be rounded in depths of not less than 30 fathoms. Anticosti lightvessel is always withdrawn in winter.

Sailing vessels bound to the gulf of St. Lawrence through Cabot strait should endeavor to make St. Paul island, which, being of considerable elevation, bold all round, and well lighted, may be made both at night and by day; with proper caution it may be steered for even in fog, unless fog is very thick.

Caution.—In approaching St. Paul island from the southeastward with northerly winds, the prevailing south-southeasterly current, which at times is considerably more westerly and sets toward Cape Breton island, should be guarded against by sounding on the bank extending off Scatari island and off the eastern coast of Cape Breton island as far northward as Ingonish. Beyond this the depth is too great to afford any guidance except that the vessel should not get soundings below 50 fathoms. The south coast of Newfoundland, eastward of cape Ray, is broken, rocky, and dangerous; there is often a strong indraft toward the land, and the tidal streams, being influenced by the winds, are irregular; while southerly and easterly winds, and often also southwesterly winds bring a thick fog, which is most dense near the lee shore. This coast, therefore, should not be approached, except with a decided northerly wind and clear weather.

St. Paul island to Bird rocks and Magdalen islands.—From St. Paul island for St. Lawrence river, endeavor, in clear weather, to make Great Bird rock, which bears from the north point of St. Paul island 312° , distant 55 miles.

In thick weather, when the lights cannot be seen, the bank around the Magdalen islands is an excellent guide up to Bird rocks, running along the northern edge of the bank and maintaining a depth of 40 fathoms until well past the rocks; then steer up the gulf.

With northerly winds the weather is usually clear; and, if far enough to windward, stand to the westward and endeavor to make Entry island, avoiding the reefs off the Magdalen islands by not ap-

proaching the islands in that part nearer than the depth of 20 fathoms. Under the lee of these islands the sea is smooth, the soundings regular, and there is good sheltered anchorage in Pleasant bay.

Having passed to leeward of the Magdalen islands with northerly or northwesterly winds the vessel will find the southwesterly wind, which usually follows, a fair wind toward cape Gaspé.

Bird rocks to Anticosti island.—From northward of Bird rocks toward cape Gaspé, the southeasterly current should be considered. By consulting the chart it will be seen that the water is deep until near the shores of Anticosti, and that soundings may be obtained upon, and southwestward of, a line joining Bird rocks and cape Gaspé, while a few miles to the northeastward of that line the depths reach over 200 fathoms.

With a fair wind make the lighthouse on Southwest point, Anticosti; with westerly winds, any part of the coast of that island which can be attained. The fixed white light on Heath point, at the east end of the island, renders it easy to make at night if the weather be clear; and if the weather be thick, the bank of soundings, that extends 23 miles to the southeastward, may serve to determine the vessel's position by the lead.

Approaching Anticosti, especially from the eastward, soundings should be obtained until the position is accurately determined, as sometimes, owing to peculiar atmospheric conditions, that island is said to be difficult to distinguish, even when the weather is moderately clear. The loss of the steamers *Titania* and *Brooklyn* was ascribed to these causes.

Northward of Anticosti island.—With a southwesterly wind, should East cape or the land in its vicinity be made, it is often preferable to proceed northward of Anticosti island, where there is a good channel, rather than to tack and stand to the southward and eastward. Under the lee of Anticosti, there is a smooth sea and often clear weather, while there may be a heavy swell and a thick fog to windward of it. Also, the current out of the St. Lawrence, which with westerly winds runs constantly between the south shore of the gulf and Anticosti, is avoided by going northward of that island; and thus good way can be made in moderate weather. At night, or in foggy weather, the bank of soundings off the north shore of the gulf is a safe guide, even although the land should not be visible, because from Natashkwan point to river St. John, westward of Mingan islands, banks of sand, gravel, broken shells, and bits of coral extend many miles offshore. Southward of these banks, and between them and Anticosti, there is a deep channel, in which, with the exception of the part northward of North point, Anticosti, the bottom is, for the most part, blue mud. Such a difference in the nature of the bottom, as

well as in the depth of water, renders the navigation of this channel comparatively easy at night or in foggy weather. Soundings must be constantly taken, while running along the southern edge of the banks of sand, gravel, and shells, and a sheer must be made occasionally to the southward into the deep water and muddy bottom, so as not to get too far to the northward. For this purpose a sounding machine, which can be relied on, is essential.

Great caution is necessary on approaching the very dangerous reefs off St. Geneviève and Hunting islands from the eastward, to keep on the southern edge of the banks, for there are deep soundings inside the outer banks, and these might lead to a mistake if caution is not used.

The Mingan islands should not be closed to depths of less than 30 fathoms; and at night or in thick weather the lead must be kept constantly going to insure keeping on the southern edge of the bank.

With westerly winds the weather is clear, and the white cliffs on the north side of Anticosti, which extend from East cape westward to West cliff opposite St. Geneviève island, will easily be seen and may be approached to within 2 miles, except in the vicinity of the reefs off Fox bay. To the westward of West cliff the coast is low and shelving, and reefs extend farther off. When standing to the northward, the soundings on the banks will show when to tack.

Currents.—(See page 49.)

Southward of Anticosti.—With westerly winds make boards of 9 to 12 miles off and on the southern coast of Anticosti, to avoid the current out of the St. Lawrence. In beating between Cormorant point and South point, beyond which at a distance of $2\frac{1}{2}$ miles and only 1 mile offshore is a rock with 16 feet of water, keep the lighthouse on Heath point open of Cormorant point. Standing inshore at night in the neighborhood of Southwest point, keep the light on this point northward of 315° ; when standing inshore to the westward of it, keep it eastward of 129° . In moderate weather a vessel will generally gain ground to windward all along the southern coast of Anticosti. From 4 or 5 miles off Southwest point, with a fair wind, steer along the coast so as to pass 8 or 10 miles southward and westward of cape Henry and West point. In thick weather the lead must be hove constantly, and a depth of 40 fathoms or upward must be maintained, since there are depths of less than 40 fathoms at a distance varying from 5 to 3 miles offshore between Southwest point and West point.

Caution.—Avoid being becalmed near the land between Southwest and West points, where both the swell and current set inshore, and where the bottom being of clean, flat limestone an anchor will not hold; and consequently it is necessary to stand offshore on the

first appearance of a decrease of wind. It is by no means uncommon off this part of the coast for the fine-weather westerly breeze of summer to die away suddenly to a calm with a smooth sea; but a heavy swell from the southwestward soon commences and continues some three or four hours before the appearance of the breeze which caused it.

Anticosti to point de Monts.—The 100-fathom curve of soundings runs approximately from Southwest point to about 20 miles from the Seven islands, whence it follows the land at distances of about 7 to 12 miles nearly to Trinity bay, and rounds point de Monts at a distance of 2 to 4 miles. Northward of this line the depths are generally less, while to the southward they are much greater. This is useful in ascertaining the position of a vessel when light winds and fogs prevail for several days in succession and the land in consequence has not been seen.

From off West point with a fair wind, especially with northerly winds, steer well to the northward of point de Monts or for about Egg island, in order to avoid the strength of the current and being set over by it to the south shore. When about halfway across steer a more southerly course, and in clear weather make the lighthouse or light, which is situated at $1\frac{1}{4}$ miles northeastward of point de Monts. Point de Monts may be approached to $\frac{3}{4}$ mile with safety, but not nearer in a large ship.

Caution.—If the weather be thick, as it commonly is with a fair wind, great caution is necessary when running up; under such circumstances, when within about 15 miles of point de Monts by the reckoning, steer a course to pass southward of the point, reduce sail, so as to have the vessel under complete command, and obtain soundings, keeping in deep water, so as to insure not being set to the northeastward of the point. Continue these until the light is seen, the fog gun heard, or until it is certain that the vessel is past the point.

Northeastward of Trinity bay there are depths of less than 60 fathoms at from 4 to 6 miles offshore; directly off Trinity bay there is the same depth 3 miles offshore, while at 3 miles off point de Monts there is no bottom at 100 fathoms. Remember the situation of the light for point de Monts.

Working to windward.—When beating up against westerly winds stand to the northward as soon as Anticosti is weathered, unless the barometer, or other indications, render it probable that the wind will become southerly. During the flood stream, make short boards off and on the north shore, and during the ebb keep farther off it, for the streams run strongest near the land. The streams, in general, are weak along this coast, and a vessel will always make way to windward in moderate weather.

From Seven islands to point de Monts the westerly wind, which is the most common wind hereabouts, is off the land, so that a vessel can frequently fetch up to point de Monts in smooth water, particularly at night, when the wind in fine weather generally veers one or two points to the northward. The flood stream also is favorable, while the ebb, being turned off by point de Monts, is scarcely felt.

A good sailing vessel with the flood stream may work round point de Monts by making short boards off the point; but with strong winds and an adverse stream she must not attempt it. The best time to get round point de Monts, with westerly winds and fine weather, is at night or early in the morning, for then there is often a northerly wind. If a strong westerly wind prevailed during the preceding day, a heavy head sea may be expected off the point; this is probably caused by the flood stream setting along the land from the direction of the Seven islands, meeting the downward current off the point. If necessary to await a favorable opportunity of passing the point, Trinity bay, with westerly winds, is a good anchorage, with moderate depth of water, good ground, and plenty of room to get under way.

Point de Monts to Bicquette island—Tidal streams.—Above point de Monts the tidal streams and currents are much stronger, and more various in their direction than in the wider parts of the estuary to the eastward of it, and shoals extend in places several miles off the north shore. Hence a good lookout and constant attention to the soundings are absolutely necessary at night or during the fogs, which are so prevalent and annoying in this locality. Under these conditions the courses to be steered above point de Monts vary under different circumstances of wind and tide.

During the ebb the downward stream is turned off to the southward, not only by point de Monts, but also by Manicouagan and Bersimis points, though to a much less degree. To this effect must be added the streams out of the large Manicouagan, Outarde, and Bersimis rivers. During the flood tide the streams out of these rivers cease, the general stream is checked in the offing, while inshore, within a few miles of the north coast, a flood stream is found.

A vessel leaving point de Monts at the beginning of the ebb will be set toward the south shore much faster than one leaving at the commencement of the flood.

With fair winds.—From 3 to 4 miles to the southward of point de Monts, with a fair easterly wind, steer 233° for a position 12 miles southward of Manicouagan shoal, then keep half a point more to the southward, 227° . These courses, if the vessel left point de Monts at or near the commencement of the ebb, will usually take her into soundings off Metis, where there is a depth of 30 fathoms over sandy bottom at 3 miles offshore, and 50 fathoms at 5 miles offshore; if she left the point early on the flood, she will probably be farther

northward, but this may not be the case as the strength of the stream is uncertain. In thick weather keep sounding, and if there is no bottom at 60 fathoms, proceed until the vessel is up as high as Metis by the reckoning, and if still without bottom, haul gradually to the southward, under easy sail, and endeavor to strike soundings on the bank off Father point, which extends several miles offshore, and on it the soundings shoal more gradually to the southward than they do farther eastward.

In clear weather from a position off Metis or Father point steer to pass about 2 miles northward of Bicquette island, the revolving light on which should be visible after having passed 2 miles beyond Father point; but in thick weather, keep sounding and run along the northern edge of the bank, being careful not to stand to the southward into less than 30 fathoms. When it is judged that the vessel is approaching near Bicquette island, having passed Barnabe, haul a little to the northward until out of soundings, and then steer 234° , still sounding, under moderate sail, so as to be sure of getting bottom, and making sure that the vessel is well above the Northwest reef of Bicquette. If depths less than 30 fathoms are obtained, haul immediately northward to a greater depth, and then steer as before. Bicquette island is very dangerous, and many vessels have been wrecked on it. Two miles north of Bicquette there are 30 fathoms, and only $1\frac{1}{4}$ miles north of Northwest reef there is the same depth, with sandy bottom. Farther off no bottom will be found at 50 or 60 fathoms. Both the island and the reef are bold to the northward, having 12 fathoms close to them.

When certainly past Bicquette island and its reefs, haul in to the southward by degrees, pick up the edge of the bank and keep on it up to Green Island reef, and it is not prudent, without a pilot or local knowledge, to attempt running inside of Bic island in thick weather. If it is absolutely necessary to do so for the purpose of anchoring, the directions for that locality should be followed.

With southerly winds.—From off point de Monts with southerly winds make a direct course, allowing for the set of stream to the southward, according to the tide, and, in thick weather, sounding. When the land can not be seen the object should always be to strike the bank of soundings along the south coast about Metis, or at the farthest Father point, and follow it as a guide to the westward.

With northerly winds.—The weather with these winds is invariably clear, and the land can be seen, but the rate of the stream to the southward is increased, and therefore the vessel must keep well to the northward, steering 243° to prevent being set over to the lee shore, and obliged to tack should the wind veer one or two points to the westward. If bearings of Point de Monts light, which must be taken and plotted frequently, indicate that the stream is setting very

fast to the southward, as it probably will, particularly during the ebb, haul still farther north, but do not approach too near the Manicouagan shoals. This may be avoided by taking care not to bring the light to bear to the eastward of 53° .

When past these extensive shoals, observing that Manicouagan point can seldom be clearly distinguished at night in consequence of the higher land behind it, haul up and run along the north shore at a distance of not less than 3 miles, avoiding the shoals which extend off it.

With foul winds—Working to Green island.—Westerly winds are almost always accompanied with clear weather; there is then little difficulty, other than that which arises from the set of the tidal streams.

From point de Monts, during the flood, make short boards off the north shore up to cape St. Nicholas. Do not, however, keep this shore close aboard farther to the westward, lest the wind should fail, for there is a strong indraft toward the mouth of Manicouagan river during the flood stream; and if an easterly wind should spring up when near the mouth of English bay, difficulty would be experienced in beating out or in weathering the eastern side of the Manicouagan shoals. It will be well here to remember that the light on point de Monts can not be seen on any bearing to the eastward of 70° , being intercepted by the high land to the westward of it, and when it disappears a vessel off Godbout river will be only $1\frac{1}{2}$ miles from the bar, or off cape St. Nicholas $2\frac{1}{2}$ miles offshore. It is therefore a safe rule when standing inshore at night to tack as soon as the light bears 60° .

At the commencement of the ebb, stretch over into the middle of the estuary, where that stream is less strong than near either shore, but do not go farther southward than the middle and be sure to come again off the north shore at the commencement of the flood.

After passing point de Monts in the morning with a northerly land wind, and there are signs of its failing or veering to the westward as the day advances, continue the board to the southward and westward, instead of tacking to keep the north shore on board, as directed when the wind is blowing right down; for the night land wind will probably be succeeded by the fine weather day wind, which usually becomes a steady breeze about 9 a. m., after commencing at southwest, and thus affords an advantageous board northwards.

In fine summer weather the wind usually veers by degrees during the day to west-southwest and west, thus offering a good board southward. Mariners with local experience of the winds and weather frequently gain more ground westward by calculating upon these probable changes of the wind than by keeping on the north shore out of the current.

With the exception of the low points of Manicouagan, Bersimis, and Mille Vaches, the land on both sides of the river can in general be plainly seen at night during the continuance of westerly winds; and where its features are sufficiently remarkable there will be little difficulty in making it out. Mount Camille, especially, being an isolated mountain 2,036 feet above high water, is easily distinguished, as well as the summit of the High land of Bic, 1,236 feet high. Their bearings will often be of great service to vessels on clear nights, and will show when they are high enough to fetch Father point.

On arriving off Father point, or anywhere between it and Bic, at the end of the flood stream and with a light wind, anchor on the bank of soundings, weighing again, if there be a breeze, in sufficient time to stand over and meet the first of the flood on the north shore. By so doing much more ground is gained to the westward than by remaining on the south shore, for although there is a weak stream of flood upon the bank of soundings from Father point to Bic island, there is little above that island, and none after the first quarter flood, excepting so close inshore as to be useless to large vessels.

From Mille Vaches bay to within 3 miles of the entrance of Saguenay river, with the exception of Mille Vaches shoals and a shoal extending a short distance offshore from the bay next westward of cape Bondesir, the north coast is moderately high and very bold, the flood is strong, and the ebb comparatively weak. Therefore make short boards along this shore until up to Bergeron coves, and then stretch over to the anchorage under Green Island reef, to wait for the next flood, for it will require a whole tide, even with a good working breeze and a fair sailing vessel, to beat through between Green island and Red islet and reach good anchorage above before the ebb makes.

Caution.—In standing across from the north shore beware of Red Islet bank, which extends $2\frac{1}{2}$ miles northeastward from the low shingle islet of the same name.

This bank is very dangerous, and the first of the flood sets strongly over it out of Bergeron coves somewhat toward Green island. The ebb out of Saguenay river also sets upon the bank. If a vessel can not fetch the anchorage under Green Island reef she may anchor anywhere in fine weather along the south bank between Bic and Green islands, and will have good ground in 12 fathoms at low water and plenty of room to get under way.

The channel to the north of Red islet should not be attempted by strangers unless there is every evidence that the wind will hold brisk, for if the wind should fall calm the vessel would run great risk of being drawn in by the stream of flood among the dangerous shoals off the mouth of Saguenay or being set down upon Red Islet bank

when the rapid ebb made out of that river. This ebb is so strong and the water so deep that no anchor will hold.

To pass to southward of Red islet with a northwest wind haul round the east end of the reef and as close to the southward of it as is prudent, coming no nearer than a depth of 20 fathoms until past the islet.

Down the estuary and gulf.—Little needs to be added to the information that may be gathered from the charts and the proper application of the directions for going up the gulf and the estuary. With fair winds and clear weather keep a moderate distance off the southern shore after passing Bicquette island. But with easterly winds and thick weather anywhere above point de Monts, great caution and attention to the soundings and set of the tidal streams and currents are necessary to insure safety, particularly during the long nights and stormy weather in the fall of the year.

In proceeding down the St. Lawrence, after passing Green island, if the fair wind fails and an easterly wind is experienced before arriving near Bic island, run up to Brandy Pots, especially if late or very early in the navigable season. But if far enough down at the commencement of the adverse wind, Bic island affords good shelter and anchorage, which should be obtained in time, before the fog commences.

There is no anchorage lower down which can be recommended nearer than Seven islands, and after that Gaspé.

When beating down, the south bank is the guide in thick weather or at night; tack from it, after striking soundings on its edge, and do not stand to the northward more than half-channel over in order to keep in the strength of the downward stream, and avoid the vicinity of the shoals off the north shore.

Effects of tides.—When upon the south bank of soundings there is much less sea than in the deep water and strength of the weather current outside, and usually there is a strong ripple at the edge of the bank during the flood stream.

In the board from near Bicquette island the flood stream sets rather to the northward, whilst the ebb sets rather to the southward. Above Razade islets both streams set to the southward. Lower down the estuary, and as far down as cape Ste. Anne, the ebb stream usually sets rather to the southward, whilst during the flood there is an indraft into the rivers on approaching the north shore from Bersimis point nearly down to cape St. Nicholas.

Caution.—When beating down on a dark night or thick weather, soundings must be constantly obtained to insure safety; when approaching the south shore, in the board to the southward, reduce sail sufficiently for soundings, to be easily taken, and have everything in

readiness to tack or wear at the shortest notice. These precautions become the more necessary as the vessel descends the estuary, and the bank of soundings becomes narrower till, eastward of Matane, it ceases to be of use. Off Matane there are 30 fathoms, sandy bottom, $1\frac{1}{2}$ miles offshore, and 60 fathoms 3 miles off, while no bottom will be found at 100 fathoms only 5 miles off. Off Cape Chat there are 30 fathoms of water but little more than $\frac{1}{2}$ mile from shore; there is no bottom at 70 fathoms a little farther off, and then as far as the point de Monts there are from 150 to 170 fathoms, blue mud bottom.

Below point de Monts there is plenty of sea room, and although the lead there is of little use, yet the south coast is so high and bold that it may generally be seen, if the fog be no thicker than is usual with a regular easterly wind up the St. Lawrence.

Lower down still, with an adverse wind and thick weather, soundings may be struck off the western end of Anticosti, or between the West and Southwest points of that island, in order to ascertain how far the vessel is over to the northward. The bank of soundings off the south side of Anticosti, between Southwest point and Pavillon river, is very narrow; but from Pavillon river to Heath point, there is plenty of warning by the deep-sea lead.

The channel northward of Anticosti is not recommended when outward bound from the St. Lawrence, because there is not only less room, but also less current in favor; nor is the route by the strait of Belle Isle, on account of the straggling icebergs, which are generally to be met with there through all the navigable season. Toward the fall of the year, however, vessels occasionally pass through it, in anticipation of the northerly winds which prevail at that season in the Atlantic.

Particular descriptions of the shore or places alluded to in these general directions, together with directions for the harbors, anchorages, rocks, shoals etc., are given in the following chapters.

CHAPTER II.

ISLANDS IN THE GULF OF ST. LAWRENCE—ST. PAUL ISLAND—BIRD ROCKS—BRYON ISLAND—MAGDALEN ISLANDS—ANTICOSTI ISLAND.

VARIATION IN 1908.

St. Paul island $25^{\circ} 47'$ W. | East cape, Anticosti island $27^{\circ} 15'$ W.
Southwest point, Anticosti island $26^{\circ} 37'$ W.

St. Paul island, in Cabot strait, the main entrance to the gulf of St. Lawrence, between the southwestern extreme of Newfoundland and the northern extreme of Cape Breton island, is composed of primary rocks, principally mica slate, dipping at an angle of about 45° to the southward. It is 3 miles long, north-northeast and south-southwest, and nearly 1 mile broad. Its north-northeastern point is a small detached rock (although it appears connected from the sea), separated by a very narrow channel from a peninsula, about 400 feet high, which, together with the isthmus joining it to the body of the island, is so precipitous as to be nearly inaccessible. The remaining and greater part of the island is also steep and precipitous toward the sea, and rises in two parallel ranges of hills, that on the southeastern coast being the higher and attaining an elevation of 500 feet.

In a valley running between these hills are two ponds at some 250 feet above the sea; these ponds supply a stream, which is about 6 feet wide, and flows into the sea in the southern part of Trinity cove; its water is of a yellowish-brown color, but of good taste and is wholesome. There are several other much smaller runs of water, one of which enters Atlantic cove. Trinity cove is on the western and Atlantic cove on the eastern side of the island, each being nearly 1 mile from its south-southwestern point; and they afford the only shelter for boats and the only good landing on the island, which is easier of ascent from them than from any other part. The island is partly wooded with dwarf and scrubby spruce trees, which are of no use except for fuel.

The island belongs to the province of Nova Scotia.

Half a mile off the island the water becomes deep, so that in approaching it in foggy weather there is little or no warning by the

lead. Although the island is so bold and high, many shipwrecks, attended with loss of life, have occurred upon it.

The varying tidal streams and currents add much to the danger arising from the fogs, which prevail in southerly, easterly, and often in southwesterly winds.

Provision depot.—A depot of provisions, furnished by the government of the Dominion of Canada, for the relief of shipwrecked persons, is on the northern point of Trinity cove, where there is also a dwelling house for the men in charge and a store. Fish are plentiful around the island.

Anchorage.—Small fishing vessels anchor off Trinity and Atlantic coves, with offshore winds, at 400 yards from the rocks, in 10 to 12 fathoms, sand and gravel bottom. In very fine weather large vessels might ride with a stream anchor, at about $\frac{1}{2}$ mile offshore, in 25 to 30 fathoms: but such vessels must be ready to weigh at the first sign of a change of weather.

Atlantic cove—Tide gauge house.—A white tide gauge house which is conspicuous from seaward, stands about 40 feet above high-water mark on the western shore of Atlantic cove.

Beacons.—Two beacons with white circular tops are on the hill in the bight of the cove above the tide gauge house, and in line, bearing 299° , lead well clear of Big Dick rock, a detached rock on which the sea breaks heavily, lying off the northeastern point of the cove. There are also two diamond-shaped white beacons about 70 yards eastward of the superintendent's house, which in line, bearing 344° , lead clear of the foul ground off the southeastern point of the cove, and indicate the best anchorage in 18 fathoms where their alignment intersects that of the two above-mentioned circular-topped beacons.

These beacons are intended for the guidance of vessels calling at the cove with supplies and mails as well as for small schooners and fishing vessels.

Lights.—There are two lighthouses on St. Paul island, one on the detached rock at its north-northeastern point, and the other on its south-southwestern point.

Northeast Point lighthouse. a white, octagonal, wooden tower 40 feet high, exhibits at 140 feet above high water a fixed white light, which should be seen from seaward in clear weather, a distance of 18 miles, except between 349° and 40° , when it is obscured by the island.

Southwest Point lighthouse, also a white, octagonal, wooden tower 40 feet high, exhibits at 140 feet above high water a revolving white light which attains its greatest brilliancy every minute, and should be seen from seaward, in clear weather, a distance of 18 miles, except between 129° and 248° , when it is obscured by the island.

Both the lights are extinguished whenever navigation is closed, without reference to any dates. Northeast light is exhibited as late in the season as there are any vessels crossing to Newfoundland, and it is resumed in March if any sealing is being done in the neighborhood of the island, although there may be no other traffic.

Fog signal.—During thick weather or in snowstorms a steam fog whistle, on the southwestern side of Atlantic cove, is sounded for 5 seconds in every minute. The fog-signal building is of wood, painted brown, and the whistle is about 137 feet above high water.

Marine signal and telegraph station.—There is a telegraph and signal station at the main establishment on St. Paul island, on the northeastern point of Atlantic cove, about 300 yards eastward of the superintendent's house.

There is no signal station at either of the lighthouses, and signals made that are not visible from the Atlantic cove station are not forwarded. Therefore, in communicating with this station the signals should be made from positions that are visible from Atlantic cove and well clear of the cliffs either northward or southward.

This signal station is included in Lloyd's system.

The telegraph cable runs from the island to Meat cove, at the northern end of Cape Breton island. A land wire crosses the island from Atlantic cove to Trinity cove.

Ice report.—This signal station is supplied with information as to ice, winds, temperature, and weather indications, which it communicates by signal to vessels requesting it.

Tides.—It is high water, full and change, at St. Paul island at 8h. 40m.; springs rise 4 feet, neaps 3 feet. Tide tables for St. Paul island are published by the Canadian department of marine and fisheries.

Life-saving station.—A lifeboat and a Lyle gun are maintained at St. Paul island.

Bird rocks, lying about 314° , 55 miles from St. Paul island, are two rocks of coarse red sandstone, or conglomerate, in strata, dipping very slightly to the southwest, and are constantly diminishing in size from the action of the sea. Although they present perpendicular cliffs on every side, it is possible with great difficulty to ascend them in one or two places; but there is no landing upon them except in the calmest sea. Every ledge and fissure of the cliffs is occupied by gannets, and the summits of both rocks are covered with them. The white plumage of these birds gives the rocks the appearance of being capped with snow, and renders them visible in a clear and moonlight night from the distance of about 7 miles.

The two rocks bear from each other 306° and 126° and are 1,400 yards apart, but owing to sunken rocks there is only a boat passage

between. Great Bird, the southeastern rock, is less than 400 yards long, and 105 feet high. North Bird, the smaller and lower rock, is divided into two precipitous mounds joined by a low ledge, the lesser of the mounds resembling a tower. A reef extends 1,400 yards north-eastward from North Bird rock, and there is a patch of breakers nearly midway and rather southwestward of the line drawn between the rocks. Great Bird rock is quite bold, excepting toward North Bird rock. North Bird rock bears 34° , distant $16\frac{1}{2}$ miles from East point, Magdalen islands, and 72° 11 miles from the eastern extreme of Bryon island.

Light.—On the summit of Great Bird rock a white hexagonal wooden tower, 39 feet high, exhibits, at 140 feet above high water, an intermittent white light every 20 seconds, thus—light, 15 seconds, eclipse, 5 seconds, which should be seen in clear weather a distance of 18 miles. The keeper's dwelling, painted white, is near the lighthouse. The International code flags are kept here to enable the keeper to make known his wants.

Fog signal.—During thick weather and in snowstorms a diaphone trumpet, operated by compressed air, sounds 1 blast of 5 seconds duration every 2 minutes.

The fog-signal building is a square, wooden structure, painted white, with the roof red. The trumpet, elevated 120 feet above high water, projects from the eastern gable of the building.

Should the diaphone become disabled, cotton-powder bombs will be exploded at intervals of 10 minutes. If a vessel's fog signal is heard in dangerous proximity an additional shot will be fired immediately, and the firing will be continued at intervals of 5 minutes until the vessel has passed the station.

Soundings.—The soundings eastward of Bird rocks afford ample warning to vessels in foggy weather. Between the rocks and East point, Magdalen islands, the depth is generally 14 to 17 fathoms, with a bottom of reddish sand, and frequently sea eggs.

Caution.—Between Bird rocks and Bryon island there is a ridge of rocky and foul ground, on some parts of which there is said to be as little as 4 fathoms water, because bottom has been seen in calm weather. Although not less than 7 fathoms has been found, shoaler spots may exist, and a vessel of deep draft should not cross this ridge, especially when there is much sea running. The two cliffy points on the north side of Bryon island, in line, lead over the northern limit of this rocky ground.

Bryon island is rather more than 4 miles long, east and west, with an extreme breadth of rather less than 1 mile; its eastern end bears from East point, Magdalen islands, 355° , $10\frac{1}{2}$ miles; its western end bears from North cape, Grosse isle, 2° , 9 miles. It nowhere exceeds a

height of 200 feet above the sea; the cliffs on the north side are much higher than those on the south, where there are several small coves in which boats may land easily with offshore winds.

This island is formed of alternating and nearly horizontal strata of red sandstone, red ocherous clay, and shaly gray sandstone. These rocks are soft and friable, forming perpendicular or overhanging cliffs nearly all round the island, which are broken in holes and caverns by the action of the waves. The soil is similar to that of Magdalen islands. A great part of the island is wooded with dwarf spruce trees, and there is a large upland tract covered with good native grass. There are a few inhabitants on this island who raise good crops, as well as cattle and sheep.

Light.—An octagonal white lighthouse, with a red lantern, 49 feet high, situated about 200 yards from the extremity of the western point of Bryon island, exhibits, at 126 feet above high water, a flashing white light showing a group of four flashes separated by intervals of 5 seconds, followed by an eclipse of 15 seconds, the total period being 30 seconds. The light should be seen in clear weather a distance of 19 miles, and it is visible in all directions except where obscured by trees and the high land of the island to the eastward.

Reefs extend nearly $\frac{3}{4}$ mile northeastward of the eastern end of Bryon island, $1\frac{1}{2}$ miles westward of its western end, and $1\frac{1}{2}$ miles southward of the sandy point in the middle of its western part. There are no marks for clearing these reefs, but bearings afford sufficient guidance. From the southern ridge of the southern reef, Bryon island subtends an angle of 97° , and the reef may be passed with the island subtending any less angle. The southern reef turns off much of the sea from the roadstead eastward of it, in which there is anchorage in 6 fathoms, sandy bottom, at 1 mile or more from the shore, with winds from north-northeast, round by north, to west. Small vessels during northwest gales lie at anchor close under the reef.

Shoals.—There are regular soundings from 9 to 11 fathoms, sandy bottom, between Bryon island and East island and Grosse island, with the exception of an extensive patch of foul and rocky ground, lying between $3\frac{1}{2}$ and $5\frac{1}{2}$ miles, 222° , from the west end of Bryon island, and which has a clear channel on either side of it. Though the fishermen see bottom upon this patch in calm weather, not less than 5 fathoms have been found on it, and it is not believed to have less water; as, however, there may be shoaler spots, it should not be passed over by vessels of deep draft, especially when there is a heavy sea running.

Fishing grounds.—Rocky places are called fishing grounds by the inhabitants of Magdalen islands, because codfish abound upon them; one of these, having 11 fathoms water, lies $2\frac{1}{2}$ miles northward

of Bryon island and extends a considerable distance parallel to the island. There is sandy bottom and deeper water south of this ridge, with anchorage in fine weather and southerly winds, off the bay on the north side of the island. Soundings extend so far off Bryon island in every direction that it can be passed safely by using the lead; but great caution is requisite in approaching the reefs, for they are very steep, especially the southern reef.

Water is neither plentiful nor easy to be obtained at Bryon island, but it may be had in small quantities by digging, and there is a spring on the north side of the narrow isthmus which joins the eastern peninsula to the remainder of the land.

Telegraph cables.—Bryon island is connected with Grosse isle and also with Heath point, Anticosti, by telegraph cables, and is thus in telegraphic connection with the mainland.

Magdalen islands.—These islands are of an irregular, curved shape, the greatest length of which, from Southwest cape, Amherst island, to East point, is 35 miles; but if the smaller isles be included, the direction and length from Deadman islet to Great Bird rock are 51° , 56 miles.

The central parts of these islands rise into hills, with rounded and frequently dome-shaped summits, attaining elevations of 200 to 580 feet above the sea, and are in general of igneous or trap rocks. Around these hills are stratified deposits of sandstone and ocherous clays, with gypsum in the hollows and basins, and occasionally in veins. No rock salt has been found, but the water of many springs and small streams is so saline as to be nearly unfit for use.

Gypsum forms an article of commerce, and some valuable ocherous pigments are found, but the inhabitants depend principally upon the cod fishery. Herring and seal fisheries are prosecuted to a limited extent.

The islands are partly wooded, but the trees are small, and mostly spruce, juniper, birch, and Canadian poplar. The unwooded parts produce good grass and afford pasturage for cattle and sheep, which, as well as ponies, are fairly numerous. The only wild animals are foxes and hares. The general character of the soil is sterile, for although good vegetable mold may occasionally be met with, yet it is usually only a few inches in depth, having beneath it either the rock or siliceous and ferruginous sands.

The climate is severe; not quite so cold as at Quebec in winter, but less warm in summer. Rain, and especially fogs, are extremely frequent, and without this humid atmosphere the islands would not have the little fertility that they possess, as the dry and meager soil requires copious and continual supplies of moisture.

From a distance seaward the Magdalen islands appear like several hilly islands, with channels between, but, on a nearer approach, they

are seen to be connected together, with the exception of Entry island, by a double line of sand bars and beaches that inclose extensive lagoons, having very narrow entrances, by which the tide finds access and egress. These sand bars are in some parts only a few feet above the sea, while in others they rise into hills of blown sand, having considerable elevation. They appear to be increasing, since there are generally ridges of sand with from 9 to 12 feet water parallel to, and from 100 to 200 yards beyond, the beach. In some places there are depths of 3 to 4 fathoms water between these ridges and the shore, a circumstance that has often proved fatal to the crews of wrecked vessels.

In a bright sunny day the cliffs of various colors, in which different shades of red predominate, the yellow of the sand bars contrasted with the green pastures of the hillsides, the darker green of the spruce trees, and the blue of sea and sky, produce an extremely beautiful effect, and one which distinguishes these islands from anything else in the gulf of St. Lawrence. In stormy weather the appearance is equally characteristic; then isolated hills and craggy cliffs are dimly seen through the rain and mist which accompany an easterly gale, and they appear joined by long ranges of breakers, which almost hide the sand bars. At such times it is dangerous to attempt making the islands, for in approaching the lower parts the breakers would probably be the first thing seen. During autumn, when thick weather and easterly gales are prevalent, a good many small craft are wrecked.

Harbors.—The islands possess no harbors for ships, but Amherst, House, and Grand Entry harbors are suitable for small vessels.

Bird rocks and Magdalen islands belong to the province of Québec.

Inhabitants.—According to a census taken in 1891, there were upon Magdalen islands 4,942 inhabitants, who are distributed on Amherst, Grindstone, and Alright islands, except a few families distributed among Entry island, Grosse isle, Bryon island, and East island.

In 1896 the population of Amherst island was about 4,500; only two families on the island were English, the remainder being of French extraction. The community is very healthy and there is no doctor among them. There are several churches and schools, and a court of justice and jail combined.

French is generally spoken on Amherst. The other islands are peopled mostly by English-speaking inhabitants.

Seals.—During the spring the fishermen leave the islands for seal hunting on the ice of the gulf. Thousands of seals which are driven on the ice to the islands by winds are killed by the inhabitants. Seals are also taken by nets in Pleasant bay.

Communication.—In the navigable season there is a steamer service with Magdalen islands twice a week from Pictou, calling at

Souris and once a week at Georgetown; Amherst is the first stopping place. There was no communication by vessel from December 15, 1895, to April 9, 1896. The islands are connected with Cape Breton island and Bryon island by telegraph cables, and a system of telegraph lines extends throughout Magdalen islands group, except to Entry island.

Supplies.—Limited supplies of fresh provisions may be obtained, especially at Entry island, and water most readily from Amherst harbor, either from a spring, which issues from under Demoiselle hill, or from a small stream which falls into Cabane bay, near Southwest cape, Amherst island. Wood for fuel is scarce near the settlements. Large spars are not to be had, unless they chance to be saved from wrecks; but there are small ones, of spruce and juniper. The last, of which the inhabitants build their fishing boats and shallops or small schooners, somewhat resembles larch wood; it is said to be exceedingly strong and durable.

East point, the northeastern extreme of Magdalen islands proper, is of low sand, inclosing several shallow ponds, and having several sand hills, some of which are near its extremity, while others, inland on the margin of the northeastern part of Great lagoon, are of greater elevation and extend in a chain nearly to Northeast cape. Northeast cape is a hill on East island, at the head of Grand Entry harbor; it is a good landmark, its isolated cliffs, 230 feet high, being visible over all the sand hills and sand bars; and when these last are below the horizon the cape appears to be the eastern extremity of the chain of islands.

Long spit.—A ridge of sand, with 2 to 3 fathoms water over it, extends about 112° , rather more than $1\frac{1}{2}$ miles from East point, and for $1\frac{1}{4}$ miles farther in the same direction there is a depth of from 4 to 6 fathoms. The tidal streams set rapidly over this spit, and, together with the shoal water, cause a heavy, breaking sea, making it very dangerous. When near it keep an anchor clear.

Leading marks.—The southern part of Coffin island is a peninsula, forming the southern shore of Oyster pond, and connected to the remainder of the island by a low neck or isthmus at the west end of the pond. The southeastern tangent of this peninsula, in line with Old Harry head, 235° , leads over the end of the spit in 3 fathoms; the north side of the peninsula, in line with Old Harry head, 241° , clears the spit in 4 fathoms, and the north shore of Oyster pond, in line with Old Harry head, 246° , clears the spit $\frac{1}{2}$ mile in 6 fathoms.

The summit of North cape, in line with the eastern side of Northeast cape, 287° , leads nearly 1 mile southward of the spit and clear of Doyle reef.

Doyle reef, 105° , distant $6\frac{3}{4}$ miles from East point, consists of pointed rocks; it is 600 yards long and 100 yards wide within the depth of 6 fathoms. The least water is 3 fathoms on one spot nearly in the middle, and there are 12 and 13 fathoms all round it. North cape, open two-thirds of its breadth northward of Northeast cape, 279° , leads over the reef; and from the reef the angle between North cape and the western point of Coffin island is $24\frac{1}{2}^{\circ}$; and that between the southern tangent of the southern peninsula of Coffin island and North cape is 26° .

Lying directly in the way of vessels and very seldom showing, because the sea breaks upon it only in heavy gales, Doyle reef is one of the worst dangers off Magdalen islands.

Old Harry head, the eastern point of Coffin island, is formed of red sandstone cliffs of moderate height, with a reef extending off it nearly 800 yards southeastward. The sandy bay between the head and East point is $4\frac{1}{2}$ miles across, and has sheltered anchorage in all winds from west-southwest, round by north, to north-northeast; but it is not recommended, because a vessel there is very much embayed by the shoals on either side, and it might be difficult to get out on the occurrence of a shift of wind either at night or during a fog.

Telegraph office.—There is a telegraph office at Old Harry cove.

Columbine shoals.—The outermost of these shoals is a patch of rocks, with 3 fathoms over it, bearing 182° , $2\frac{1}{2}$ miles from Old Harry head. Within this patch, and also toward Coffin island, are numerous small shoal patches and pointed rocks, on some of which there are not more than 3 feet at low water. They are very dangerous and much in the way of vessels hauling round East point with northerly winds.

The high Northeast cape, open for its whole breadth eastward of Old Harry head, 349° , leads eastward of the shoals; East point, bearing northward of 21° , leads southeastward of the shoals; and the western end of Coffin island, northward of 300° , leads westward, but this bearing will not clear the foul ground extending about $\frac{3}{4}$ mile off Coffin island. On the outer edge of the shoals the angle between Old Harry head and the western end of Coffin island is 77° ; with these points subtending any less angle, a vessel will pass outside of the shoals. The use of the sextant with this angle is the surest and safest method of passing them.

Coffin island extends 4 miles southwestward of Old Harry head, and on its southern side has a lagoon with a very narrow outlet, named Oyster pond, which boats can enter only in fine weather. There are several rocks and foul ground besides Columbine shoals off the coast of the island. This part of the island is very dangerous and should not be approached at night nor in foggy weather.

Grand Entry harbor.—The entrance of this harbor, which is about 200 yards in width, lies between the western end of Coffin island and the sand bars westward of that island. There is water enough in the harbor for vessels of moderate size; but the narrow channel leading to the entrance between sandy shoals, which are said to shift after heavy gales, extends 1.2 miles, 220° , from the entrance. The least depth in the channel was about 12 feet at low water in 1901; there are 28 feet water at, and immediately within, the entrance. The ebb stream runs out with great rapidity, and the flood in is also strong. Along the northern side of the spit running northward from the western end of Coffin island there are a number of white fishing houses with black roofs, which are conspicuous when open clear of Coffin island. Running off the same side of the spit are some fishing wharves and a pier with a depth of 10 to 12 feet at its outer end at low water. The eastern end of the sand bar on the western side of the entrance is marked by three large, old fishing buildings.

Telegraph office.—There is a telegraph office at Grand Entry.

Light.—A white pole, 30 feet high, which has a white shed with a red roof at its base, on the northwestern extreme of the sand spit running northward from the western end of Coffin island, exhibits at 29 feet above high water, a fixed red light which should be visible in clear weather a distance of 4 miles in the channel approach.

Buoys.—The southwestern end of the entrance channel into Grand Entry harbor is marked by a red can buoy, moored in 15 feet, at about 223° , 1.2 miles from the pole light.

Between this buoy and the pole light the channel is marked with six black spar buoys to be left on the port hand, and four red spar buoys and one red barrel buoy to be left on the starboard hand entering. These buoys are moved to suit the channel, which is liable to change.

There is also a black spar buoy near a 4-foot shoal at about 400 feet, 25° from the pole light. This buoy is for the purpose of marking the north edge of the channel into the fishing wharves on the north end of the sand spit.

Directions.—The channel into the harbor should be attempted only with a leading wind, flood stream, and fine weather. Keep to the buoys.

Lagoon.—Within the harbor there is a large expanse of water, from 1 to 3 fathoms deep, extending northeastward to the southern sides of Grosse island, and communicating by a narrow channel with a large shallow pond, which passes Northeast cape, and extends to within about 2 miles of East point. This great lagoon also extends southwestward, between a double line of sand bars, to Grindstone

island, and is, in all, 23 miles long, and from $\frac{1}{2}$ mile to 3 miles wide. Throughout its whole extent, quite sheltered from the sea, there is a communication for boats at high water. There are at present three entrances into this lagoon from the sea; namely, Grand Entry harbor; another $3\frac{1}{2}$ miles westward which is very shallow, and House harbor, near its southwestern extremity, between Alright and Grindstone islands. There were formerly others, which have closed since 1778. On the other hand, the second mentioned above opened after that time.

There are a few families in the vicinity of Northeast cape who breed cattle.

Shag island, lying off the southeast coast of Magdalen islands, out of the way of vessels, about $\frac{1}{2}$ mile from the sand bars, and nearly midway between Coffin and Alright islands, is small, low, and composed of sandstone.

Cape Alright, Alright island, 230° , $16\frac{1}{2}$ miles from Old Harry head, is the southeastern headland of Alright island, and makes a good landmark. The cliffs along the coast of the island of a general grayish-white color, with some places low down of brick-red, are 400 feet high at their highest part, which is about 1 mile northeastward of the cape, and those westward of the cape, toward House harbor, are also high, and of the same color. Nearly 1 mile inland, north of the cape, is the summit of Alright island, 420 feet above the sea. Between this summit and the cape there is a remarkable hill named la butte Ronde. The south extreme of the cape is low, with a small rock close off it.

Point à Elie is the extreme southeastern point of the island. A steamer calls here for mails and freight, and also for shelter in northeasterly gales. A landing pier and breakwater, lately built, give good shelter from all directions, and especially from the easterly gales that prevail in spring.

Alright reef, the outer edge of which lies 80° , $3\frac{1}{4}$ miles from cape Alright, is 800 yards long, 600 yards wide, and is composed of white pointed rocks with a least depth of 6 feet. From the reef, la butte Ronde is in line with the summit of Grindstone island, 262° , the southern side of cape Alright is in line with the southern side of cape Meule, 256° , and the woody Wolf island is just open westward of Shag island 2° . The well-marked summit of Grindstone island, open southwestward of cape Alright 267° , leads southwestward; and the eastern side of the woods of Wolf island (seen over the sand bars), open eastward of Shag island 354° , leads eastward of this reef.

Entry island lies 7 miles south-southeastward of cape Alright, and between them is the entrance into Pleasant bay.

Pearl reef, small and dangerous, of white pointed rocks, is round, about 400 yards in diameter, with a least depth of 8 feet on it, and

even with a moderate swell the sea breaks heavily upon it. From the reef the northeastern point of Entry island bears 237° , distant $4\frac{1}{2}$ miles; cape Alright bears 297° , distant $8\frac{1}{4}$ miles. The southeast tangent Entry island 126° , the northwest tangent 242° , Demoiselle hill is in line with the extremity of the northwestern spit, above water, of Entry island 243° (this spit, however, can seldom be seen from the reef), and the three high cliffs on the southwestern side of Alright island are nearly in line, bearing 294° . Hence, all the cliffs open lead westward; and the northwestern cliff completely shut in behind the other two leads eastward, Demoiselle hill shut in by the north side of Entry island 246° leads southward; and Demoiselle hill kept an angle of more than 6° open northward of Entry island leads northward of the reef.

House harbor, an important port, lies at the western end of Alright island and $2\frac{3}{4}$ miles northwestward of cape Alright. Its entrance is a narrow and crooked channel, with a depth of only 6 feet at low water. There is a landing pier and a telegraph office.

Grindstone island, the second largest of the chain of Magdalen islands is of a circular shape, and about 4 miles across; its summit is 550 feet above high water. Considerably more information about the island and about the light on it is given under **Gull island**.

Rock.—A rock with 3 feet of water on it lies to the southward of the southwest side of Alright island. From it cape Alright bears 84° , distant $2\frac{7}{8}$ miles.

Cape Meule, the northern of the two prominent capes on the east side of Grindstone island, formed of gray sandstone, is 254° , $3\frac{1}{2}$ miles from cape Alright. At the head of the bay between them $1\frac{1}{2}$ miles northward of cape Meule is the entrance to House harbor.

Meule rocks—Buoy.—Meule rocks, extending $\frac{3}{4}$ mile seaward of cape Meule, are marked on their outer extremity by a black buoy moored in 15 feet water, 100 yards east of a 6-foot patch. Nearly midway between the buoy and cape Meule there is a channel into Leslie cove having 18 feet water, but this should not be used in rough weather.

When entering House harbor pass eastward of the buoy; when entering Leslie cove pass southwestward of it, and then steer to the northwestward.

Grindstone village is on the southern side of Grindstone island at 4 miles east of the Etang du Nord; it is settled principally by Scotch farmers and Acadian fishermen. For some years past most of the freight for Magdalen islands has been unloaded here, and a landing pier and breakwater are partly constructed. There is a telegraph office.

Red cape, 208° , $2\frac{1}{4}$ miles from cape Meule, and 237° from cape Alright, is the southeastern point of Grindstone island, and the northern point of Pleasant bay, the southeastern point of which is Sandy Hook. Between Red cape and cape Meule is Leslie cove, a slight indentation of the coast of Grindstone island.

Red cape has no remarkable features; but from its situation is easily recognized.

Amherst island, the southwestern and largest of the Magdalen islands, is connected with Grindstone island by a double line of sand bars, inclosing an extensive lagoon, $7\frac{1}{4}$ miles long, and from 1 to $2\frac{1}{2}$ miles wide, the southern part of which is named Basque harbor. This lagoon is full of sands, which are dry at low water, and it has three outlets into Pleasant bay. The southern of these is the deepest, but it has only 3 feet of water over its bar at low water. The others will admit boats only at high water, and when the surf is not too high. This applies also to three outlets to the Gulf through the sand bars of the west coast.

The hills in the interior of Amherst island rise 550 feet above the sea. Toward the southeastern part of the island, and about 1 mile west-northwestward of Amherst harbor, is the remarkable conical Demoiselle hill. It is composed of trap rock, is 280 feet high, with dark red perpendicular cliffs.

Sandy Hook, the eastern point of Amherst island, bears 141° , distant 6 miles from Red cape; from this line to the coast of Amherst island at the head of Pleasant bay is a distance of 4 miles. The Hook is a narrow sandy point dotted with sand hills, extending nearly 2 miles 32° from the main southeastern part of Amherst island.

From the Hook a considerable shoal extends $\frac{1}{4}$ mile northward, 2 miles eastward, and $1\frac{1}{2}$ miles southeastward, having soundings from 12 to 4 feet. The southeastern part of the shoal is called **Sandy Hook flat**.

Pleasant bay, inclosed between Red cape and Sandy Hook, is the best roadstead in Magdalen islands, and the only one where vessels can venture to lie with all winds during June, July, and August, the finest time of the year. In those months an easterly gale so heavy as to endanger a vessel with good anchors and cables occurs only once in 3 or 4 years. However, the riding is often heavy and rough in northeasterly gales, and a vessel should be well moored with at least 90 fathoms on the seaward anchor, and all snug aloft.

Anchorage.—The best and most sheltered anchorage is in 4 fathoms, with cape Gridley, the rocky entrance point of Amherst harbor, bearing 207° , distant $\frac{2}{3}$ mile, and with high-water mark on the sandy beach to the southeastward a little more than $\frac{1}{2}$ mile distant. From this anchorage a remarkable high sand hill on Sandy Hook

will bear 151° . In a vessel of deep draft, anchor farther off in deeper water. The bottom everywhere is excellent holding ground, of red sandy clay.

The anchorage is sheltered, except from the northeastward, and even with the wind from that direction the sea is much lessened by passing over the shoal water; nevertheless, a vessel at anchor there during a heavy easterly gale, either before June or after August, is in great danger, and in a heavy easterly gale at any time Pleasant bay is not a desirable place.

In the northern and western parts of the bay sandy flats extend more than 1 mile from the beach.

Amherst harbor, in the southeastern corner of Pleasant bay, is formed by a peninsula whose southern end is cape Gridley, which presents cliffs of gray sandstone to seaward. The harbor entrance, between this peninsula and the sands southward, is $2\frac{1}{2}$ miles within or southwestward of the extremity of Sandy Hook, which is a long and narrow sandy point with sandhills. The harbor entrance, though the easiest of access of any in the Magdalen islands, is extremely narrow and rather crooked, so that, without a pilot, it is necessary to buoy the channel; but there is an excellent roadstead outside, where vessels may await their opportunity of running in.

The depth over the bar, which is rocky, is 8 feet at low water springs. Within the harbor there is an area of about 400 yards square, with depths of 10 to 18 feet, over soft, black, and fetid mud, well sheltered from every wind.

Amherst is a port of considerable importance; and steamers, plying between Pictou, Souris, and Magdalen islands, call there twice every week. There is a landing pier at point Shea, 488 feet long, with a depth of 17 feet water at its outer end at low water springs.

Telegraph office.—Amherst village, which has a telegraph office, is situated near the harbor.

Ice.—The harbor is usually frozen over about January 1 and is clear of ice about May 10, being completely closed between January 1 and May 1. Field ice generally drifts in toward the island about January 15 and disappears about May 12. The first vessel arrives from sea about May 10 and the last one leaves about December 17.

Sandy Hook channel, between Amherst and Entry islands, is $2\frac{1}{2}$ miles wide, but a considerable sandy shoal extends 2 miles eastward from Sandy Hook, leaving a navigable breadth of little more than $\frac{1}{2}$ mile between it and the rocky shoals off the west side of Entry island. Off the eastern end of Sandy Hook shoal, which is steep to, a red buoy is moored in 5 fathoms. There are several rocky patches of $2\frac{1}{2}$ fathoms off the southwest point of Entry island, reaching $\frac{3}{4}$ mile from the shore. The ebb tidal stream sets strongly through

this channel and over Sandy Hook flat. Vessels of deep draft should not use this channel, but should go to the eastward of Entry island.

Directions.—A depth of 4 fathoms can be carried through Sandy Hook channel by a good pilot, but $3\frac{1}{2}$ fathoms is the most that can be safely reckoned on by a stranger.

From the southward, keep the eastern extreme of Alright island bearing 353° , just open westward of the shingle and sandy spit forming the northwestern point of Entry island (Northwest spit), until abreast of the southwestern point of Entry island, then haul up for the summit of Grindstone island, passing eastward of Sandy Hook shoal buoy; but if the buoy is not watching, the edge of the sand shoal to the westward can generally be seen.

Entry island, whose summit is 580 feet above high water, is the highest of the Magdalen islands. Its beautiful red cliffs at the northeastern point are 350 feet high, and at the southern point 400 feet. High rock lies about 100 yards from the cliffs at the northeastern point of the island, and the remarkable Tower rock, of red sandstone, is joined to the northern side of the island. Tower rock may be seen from the southwestward over the low and sandy Northwest spit, as well as from the northeastward.

Light.—On a hill on the southeastern side of Entry island an octagonal white wooden lighthouse with a red octagonal lantern, 32 feet high, exhibits at 277 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 16 miles from 222° through west, north, and east to 132° . Through the remaining 90° of the circle the light is intercepted by the high hills northward of it.

Shoals.—Besides the rocky patches in Sandy Hook channel and off the southwestern point of Entry island, there are others extending $\frac{1}{4}$ mile off the southern and southeastern sides.

Andromache rocks are several pinnacle rocks with deep water between them, lying off the northeastern point of Entry island. The two nearest the shore, with 11 feet water, are not beyond 250 yards from High rock; two others, with 17 feet water, are distant 400 yards and 450 yards, respectively, from High rock on the same line of bearing; and a patch, with $3\frac{1}{2}$ fathoms water, is at $\frac{1}{3}$ mile out in the same direction. To give these rocks a good berth when passing eastward of Entry island, do not haul round High rock at a less distance than $\frac{1}{2}$ mile and avoid Pearl reef, which lies, 58° , 4 miles farther off.

Anchorage.—Vessels generally anchor under Entry island in northerly and easterly winds, but it is rough riding because of the sea that rolls round the island. The best anchorage in easterly winds is in Sandy Hook channel under Northwest spit, in 5 fathoms, sand.

Supplies.—The inhabitants of Entry island raise cattle and sheep, depending more upon the sale of fresh provisions than upon the fisheries. Supplies may therefore almost always be obtained.

Amherst island.—The southern coast of Amherst island from Sandy Hook, consisting of sand hills and beaches, with shoal water from $\frac{1}{2}$ mile to 1 mile off, curves round southward and westward for 6 miles, to the entrance of the basin, which extends across the island to about $\frac{1}{2}$ mile from Pleasant bay. The basin is so nearly closed with sand that boats can enter only at high water and in the finest weather. There is good anchorage off the entrance, in 6 to 9 fathoms, sandy bottom, with winds from north-northwest through north to east-northeast.

At $1\frac{1}{2}$ miles westward of the entrance to the basin cliffs commence and continue, except in Cabane bay, to West cape, which is the highest cliff of the island, its summit being 300 feet above the sea. There is a remarkable rock above water close to the land at about a quarter of a mile southward of the cape. The prominent landmarks on the coast are cape Percé, $2\frac{1}{2}$ miles, 259° , from the entrance to the basin; South cape, $\frac{3}{4}$ mile, 256° , from cape Percé, and Southwest cape, $1\frac{1}{2}$ miles, 282° , from South cape. Between Southwest and South capes is Cabane bay.

From Southwest cape the coast turns abruptly to about northwest for 1 mile and then turns sharply to the northward for $\frac{1}{2}$ mile to West cape.

Light.—On South cape, Amherst island, a white hexagonal wooden building, 54 feet high, exhibits, at 107 feet above high water, an alternating light, showing alternately red and white every 30 seconds, which should be seen in clear weather a distance of 16 miles. This light is visible through an arc of 198° , from 261° , to 99° . It is obscured by the island through the rest of the circle.

Marine signal and telegraph station.—There is a marine signal and telegraph station at this lighthouse, which is included in Lloyd's system of reporting stations.

Ice report.—This signal station receives special reports on the ice and the state of navigation in the gulf during April and May, which it communicates by signal to vessels asking for the information.

Cabane bay is a small bight, between South and Southwest capes, with safe anchorage in northeasterly winds, and where good water may be obtained. The best berth is in 8 to 9 fathoms, sandy bottom, off the middle of the bay, with South cape and cape Percé in line, and $\frac{3}{4}$ mile offshore.

Deadman islet, 280° , nearly $7\frac{3}{4}$ miles from West cape of Magdalen islands, is about 600 yards in length, east and west, and less than 150 yards in breadth. It is about 170 feet high, with

steeply sloping sides, and when seen end on resembles a pyramid. From a distance northward or southward its outline much resembles that of a body laid out for burial, whence its name. The islet is composed principally of trap rocks, and its western side is so bold that it may be safely passed at the distance of 400 yards, but a reef extends $\frac{1}{3}$ mile toward Amherst island.

Caution.—At night, or in foggy weather, vessels should beware of Deadman islet, for there is nearly as much water within $\frac{1}{2}$ mile of it as at a distance of several miles, and therefore the lead gives little warning of approach.

Fishing grounds.—About 1 mile northward of Deadman islet there is a rocky fishing ground with 8 fathoms least water, and 6 miles southward of it there is another with 11 fathoms.

The coast of Amherst island, northward of West cape, consists of red cliffs, without beach, but with shoal water $\frac{1}{3}$ mile offshore. to West lake, which is a pond at the southwestern end of the sand bars joining Amherst and Grindstone islands.

Gull island.—At the northeastern extremity of these sand bars is Gull island, which is small, rocky, and close to the western point of Grindstone island, with shoal water extending $\frac{1}{3}$ mile westward of it. About $1\frac{1}{2}$ miles southwestward of the island, nearly $1\frac{1}{4}$ miles off the northwestern outlet of Basque harbor, and with the western side of Gull island and Gros cap in line, lies Rocky bank, with 3 fathoms over it at low water, but no good passage between it and the shore.

Étang du Nord.—Close northeastward of Gull island is Étang du Nord, a small inlet, affording good shelter to boats. On the shore of the inlet is a village with a telegraph office.

Grindstone Island light.—On the western side of Grindstone island, at about $\frac{3}{4}$ mile northward of Étang du Nord, a square white lighthouse, 42 feet high, exhibits at 97 feet above high water a revolving white light, which attains its greatest brilliancy every 90 seconds, and should be seen in clear weather a distance of 15 miles.

There is a telegraph office at the lighthouse.

Hospital cape.—The northern and northwestern coasts of Grindstone island are of red sandstone cliffs terminating in Hospital cape, almost a peninsula, 44° , $3\frac{1}{2}$ miles from the light on Grindstone island. Nearly half way between the light and Hospital cape is cape le Trou.

Hospital rock.—Near the extremity of Hospital cape, close in, lies Hospital rock. Some rocky 3-fathom patches lie a little more than $\frac{1}{2}$ mile from shore.

White Horse reef lies 269° , $5\frac{1}{2}$ miles from Gull island. 35° , $7\frac{1}{4}$ miles from Deadman islet, and 257° , $6\frac{1}{4}$ miles from Grindstone Island light. It is about 200 yards across, and has 10 feet least water over

pointed rocks, on which the sea often breaks, thus rendering it dangerous.

From the reef, the western extreme of Amherst island and Hospital cape (the northwestern extreme of the cliffs of Grindstone island) subtend an angle of $91^{\circ} 30'$; with these points subtending a less angle by 3° or 4° a vessel will pass outside the reef, and with an angle of 95° she will pass between the reef and the shore.

There are irregular soundings and foul ground between this reef and shore, but nothing less than 5 fathoms, except what has been described.

Pierre de Gros cap, a dangerous reef of rocks about 200 yards across, with 18 feet least water, seldom shows, as the sea breaks upon it only in very heavy weather. It lies 282° , $4\frac{1}{2}$ miles from Hospital cape, and 302° , $3\frac{3}{4}$ miles from cape le Trou.

From the reef the summit of Alright island is in line 102° , with the northeastern point of Grindstone island, which is in the lagoon, and very nearly in line with Hospital cape; and la butte de Portage, a hill in Amherst island situated about $1\frac{1}{2}$ miles west-northwestward of Demoiselle hill and bearing 159° , is in the middle of the narrow passage between Gull island and the west point of Étang du Nord. These marks open lead northeastward and southwestward of the reef, and a vessel will pass well clear outside of it; and Deadman islet bearing southward of 205° leads more than 1 mile to seaward both of White Horse reef and of Pierre de Gros cap.

Wolf island.—The northwestern coast of Magdalen islands from Hospital cape to Wolf island, a distance of 10 miles, consists of sand beaches and sand hills; Wolf island, which is about $\frac{3}{4}$ mile long, has low sandstone cliffs, but from the island the sand beaches continue with occasional high sand hills, 9 miles farther to North cape. At nearly $\frac{1}{2}$ mile off Wolf island there is a rocky 3-fathom shoal, and between Wolf island and Hospital cape are two other 3-fathom shoals, but off all this coast the sand bars may be safely approached by the lead to a depth of 10 fathoms.

Telegraph.—There is a telegraph office at Wolf island, and Grosse isle is connected with Bryon island by cable.

North cape, the northern point of Grosse isle, is a precipice of considerable height, but not so high as the southwestern point of the same island, which is in the Great lagoon and 300 feet above the sea.

The northern coast of Magdalen islands continues from North cape, in a curved line of sand beaches and sand hills, for $5\frac{1}{2}$ miles, to East point.

North cape rocks, some of which are always above water, lie westward of North cape, and extend 1,200 yards offshore. The west-

ern end of these rocks bears 312° from the high southwestern side of Grosse isle, and their northeastern limit is marked by the northeastern sides of North and Northeast capes in line.

Marine signal and telegraph station.—There is a marine signal and telegraph station at Grosse isle.

Ice report.—This signal station receives special reports on ice, and the state of navigation in the gulf and river St. Lawrence during April and May, and communicates them to vessels asking for the information by signal.

Water may be had in small quantities near the houses on the eastern side of North cape.

Anchorage.—There is open anchorage with plenty of room to get underway for southerly winds, eastward of North cape, in about 9 fathoms, sandy bottom and good holding ground.

Directions.—Vessels passing southward of the Magdalen islands make Entry island from the eastward, which at a distance to the westward appears like a double-peaked hill, sloping somewhat abruptly down to perpendicular and high cliffs on either side. Southwest cape, Amherst island, is also a steep cliff, but of less height; and the land rises from it in undulations to the higher parts of the island. As there is no land southward and westward of Southwest cape, the cape can not be easily mistaken. In foggy weather the soundings affords a good guide to pass southeastward of the islands. In fact, the soundings all around the Magdalen islands will be of invaluable assistance to vessels at night or in foggy weather. The charts show the soundings, and the intelligent navigator will know how to use them.

Tides.—It is high water, full and change, at Amherst harbor and at Grand Entry harbor at 8 h. 20 m.; ordinary springs rise 3 feet, and neaps 2 feet.

Tidal streams.—The tidal streams or currents around Magdalen island are very variable both in rate and direction; and while it is difficult to state their peculiarities with accuracy, the following description will serve as a guide in ordinary weather, and is compiled from the best obtainable information.

A few miles outside Bryon island and Bird rocks, there is usually a current setting southeastward out of the gulf of St. Lawrence, but the stream of flood tide flows between them and Magdalen islands. The flood stream sets northwestward and is divided by East point. One branch of the stream sets strongly over Long spit, which, with Old Harry head and the shoals off it, turns it off southwestward toward Entry island, leaving nearly slack water in the bay between Coffin island and cape Alright and also in Pleasant bay. The other branch passes northward of the islands from East point

round to Southwest cape, Amherst island, whence the greater part of the stream continues southwestward, while the remainder runs along the southern coast of Amherst island, until it meets the other branch of the stream from East point, setting off the eastern side of Entry island. The streams then combine and turn gradually round, joining the general weak flood stream setting westward in the offing.

On the southeastern side of the islands the ebb stream sets strongly out of the lagoons and out of Pleasant bay through Sandy Hook channel, between Sandy Hook and Entry island. It also often runs westward along the southern coast of Amherst island, round it, and northeastward to southeastward along the western and northern coasts of Magdalen islands from Southwest cape to East point. In the offing, at the same time, the ebb stream sets northeastward and over Long spit, where it meets the southeast-going stream, which has followed the western and northern coasts of the islands from Amherst island to East point. This meeting of the two streams, together with the shoalness of the water, causes so heavy a breaking sea in strong easterly winds that the fishing craft at times dare not venture to pass the point.

The above observations hold good as a general rule, and, although subject to occasional interruption, recur with considerable constancy in fine weather.

The rate of either stream seldom amounts to 1 knot, excepting close inshore or round the points. The ebb is generally the stronger stream, and its rate is increased by westerly winds, as the rate of the flood is by easterly winds.

Anticosti island, situated in the entrance of the northwestern arm of the gulf of St. Lawrence, is 122 miles long, northwest and southeast, with a greatest breadth of 30 miles, and a perimeter of about 270 miles, following the coast from point to point across the bays. Its coasts are everywhere of silurian limestone rock formation, affording in some parts excellent building stone and means of making the finest hydraulic lime. On or near the coasts, especially in places exposed to the wind and salt spray, the limestone soil is covered with a thick and often impenetrable forest of dwarf spruce, which in some exposed situations is only a few feet in height, with branches so gnarled, twisted, and matted together that a man may walk for a considerable distance on their mass. Extensive banks of limestone shingle, also bush swamps, morasses, and beds of peat are common.

Anticosti does not in any part exceed 700 feet above the sea in height. Its south coast is low and shelving, with reefs of flat limestone, which dry at low water; but there is a range of highlands within Southwest point, which extends for some miles both northwestward and southeastward of the point. The north coast between

East cape and West cliff, a distance of about 75 miles, is of considerable elevation, bold and precipitous. Parallel ridges of table-land that rise gently with the strata from the southwest terminate on the north coast in picturesque headlands ending in magnificent cliffs of limestone, which the effects of the weather have made so nearly white that they resemble chalk. Some of these cliffs are upward of 400 feet in perpendicular height. The north coast between West cliff and West point is like the south coast, low, with reefs of flat limestone.

Harbors.—There are no good harbors for large vessels in Anticosti, the best of them being suitable for vessels drawing not more than 12 feet.

Caution.—The reefs of flat limestone, extending in some parts $1\frac{1}{4}$ miles offshore, the want of anchorage on most parts of the coast, and above all the frequent fogs render great caution necessary in approaching Anticosti.

Anticosti island, a part of the province of Quebec, was purchased in 1895 by M. Henri Menier, of Paris, France, who has since had a good deal of work done in settling and exploring his property.

Productions.—Nearly the whole of the interior of Anticosti is covered with large spruce, balsam, birch, pine, larch, and poplar timber, which is being made into lumber and wood pulp. The soil of the island is in almost all parts of the interior of good quality, adapted for the growth of grain, hay, and vegetables. Large numbers of cattle, sheep, pigs, and horses are fed on the farms. It is doubtful if there are any minerals on the island.

Fisheries, animals, etc.—Salmon are found in many rivers of the island and trout in many brooks and lakes; these fish are protected. Seals frequent the reefs and are killed annually in great numbers. Codfish, halibut, herring, haddock, and eels are caught off all the coasts of the island. Lobsters, canned in two important factories at Goose point and Fox bay, are largely exported. In the fishing season every year schooners visit the island to buy bait, including herring, caplin, and squid.

Black bears and red deer are numerous in the interior of the island. Black, silver, and crossed fox, black and brown marten, and otter produce the best furs found there. Rabbits are not permitted at all on the island, and pigs must be kept in bounds, not being allowed to run wild.

Wild geese, partridge, snipe, eider, and duck are abundant.

Population.—The inhabitants of Anticosti, including the light-keepers and their families, numbered 500 in 1904.

Climate.—The climate of Anticosti is far less severe than that of the mainland or even of Quebec; the winter is more temperate and the summer is cooler. The sky, even in winter, is remarkably clear. As

grains and vegetables are now largely grown, either the rigor of the climate has hitherto been exaggerated or it has been modified by clearance and settlement.

Communication.—The steamer *Savoy*, belonging to the proprietor of the island, makes weekly trips to the mainland and round the island. The Dominion steamers of the lighthouse and fishery protection services visit Anticosti; a schooner stops at Ste. Claire every fortnight on her passage between Gaspé and the north coast, and numbers of fishing boats and yachts pay annual visits to the ports.

Rivers.—Streams of excellent water flow into the sea from all parts of the coasts of Anticosti. The largest rivers are: Jupiter, Salmon, Shallop, Vaureal, Potato, McDonald, Otter, and Oil. These are salmon rivers. Fifty others of small size abound with brook and sea trout.

Lights.—Four lighthouses are erected on Anticosti—one each on Heath point, at the east end of the island; Bagot bluff, $\frac{3}{4}$ mile from South point; Southwest point, and West point. The lights will be described in their proper order in the book.

Ice report.—At each of the above lighthouses there is a marine telegraph and signal station which receives and transmits to vessels requesting them special reports on ice, wind, weather, state of navigation, etc., in the river and the gulf.

Telegraph offices.—Besides the offices at the lighthouses, there are telegraph offices—not signal stations—at Shallop creek, Salt Lake bay, and Becschie river.

East cape.—The southeastern termination of one of the numerous densely wooded ridges in this portion of the island is a long, rounded projection, the extreme being a limestone cliff 49 feet high. The northern side of the cape is steep to, but a ledge, dry at low water, extends 450 yards from the southeastern extreme.

A conspicuous patch of sand on the face of a steep slope lies close southward of this ledge, and the cliff southwestward of the patch rises to a height of 90 feet, falling again to 45 feet in a projection that forms the northern side of Wreck bay.

Lightvessel.—A lightvessel, moored in 22 fathoms at 131° , $8\frac{1}{2}$ miles from East cape, and 106° , 8 miles from Heath point, exhibits from each of her two mastheads, at 60 feet above water, an intermittent white electric dioptric light every 15 seconds, thus: Light, 10 seconds; eclipse, 5 seconds, which should be seen in clear weather a distance of 13 miles. If the electric lights fail from any cause, fixed white oil lights of less intensity will be shown.

The lightvessel is a steel steamer with two masts and no bowsprit; the hull is painted red, with **Anticosti** on the sides and No. 15 on each bow in white; the circular gallery under the lanterns at

each masthead, the funnel, and the fog trumpet between the masts are all painted red.

The light vessel is withdrawn during the winter.

Fog signals.—A diaphone trumpet worked by compressed air, in thick or foggy weather, gives one blast of $4\frac{1}{2}$ seconds' duration every minute, thus: Blast, $4\frac{1}{2}$ seconds; interval, $55\frac{1}{2}$ seconds. If the trumpet is disabled, a whistle will be sounded in a similar manner, and if the whistle is unavailable a bell will be rung by hand.

Submarine fog bell.—The lightvessel has been fitted with a submarine bell, which during thick or foggy weather gives strokes indicating the lightvessel's number (15), thus: 1 stroke; interval, 4 seconds; 5 strokes at intervals of 1 second; interval, 10 seconds.

Vessels equipped with receiving apparatus should be able to hear the bell at the distance of 5 miles and to determine its bearing within a quarter of a point. Vessels not so equipped should be able to hear it, at a distance of 1 to 2 miles, from a position within the listening vessel below the water line and close to the vessel's side.

Instructions have been given for the bell to be struck whenever a vessel approaches within 5 miles, and mariners are requested to report the distance at which they hear it.

Wreck bay is a shallow bight between East cape and Heath point, and the shores are foul to the distance of nearly $\frac{1}{2}$ mile, while on its northern side is an isolated rocky patch with 10 to 15 feet on it at low water. The bottom of the bay is rock and the anchorage is indifferent, but it is frequented by fishing vessels during northwesterly winds. The bay should not be approached with southerly or easterly winds, as a heavy sea rolls in. Landing may generally be effected, except in bad weather, in the western corner of the bay near a small storehouse, where a projection of the shore reef gives some shelter to boats; but if there is much swell, the shore must be approached with great caution. There is a lake of fresh water close inshore of the landing place.

Tidal stream.—The stream setting southwestward past East cape sometimes turns sharply into Wreck bay, and necessitates caution in this locality.

Heath point is of limestone, about 10 feet high, with a superstratum of peat, in which there are several ponds of dark bog water. Being so low, this point disappears below the horizon from the distance of a few miles; the lighthouse then may appear as a sail off Anticosti, and in any case the lighthouse will be very useful to vessels by marking the extent of the low land.

Light.—A circular tower on Heath point, 95 feet high and painted white with one red horizontal band, exhibits, at 110 feet above high water, a fixed white light, which should be seen a distance of 15 miles

in clear weather over an arc of 213° between the bearings of 208° and 61° .

Fog signal.—During thick weather, fogs, or snowstorms an explosive fog signal is fired every 15 minutes, and if a vessel's fog signal is heard in dangerous proximity an additional signal is fired and repeated every 5 minutes. Too much dependence should not be placed on hearing this signal.

Marine signal and telegraph station.—There is a marine signal and telegraph station at the lighthouse, which is also an ice-report station. This station is included in Lloyd's system.

Wireless telegraph station.—There is at the lighthouse also a wireless telegraph station, maintained by the Dominion government. Its call letter is HP.

Heath point reef and foul ground with depths of less than 5 fathoms extend $1\frac{1}{4}$ miles southeastward and nearly 3 miles northeastward from the lighthouse. A rocky bank with 3 fathoms least water over it lies 92° , $1\frac{1}{2}$ miles from the lighthouse; there are depths of 6 to 7 fathoms between it and the shore reef, but any swell breaks over both reef and bank. A bank, with 10 fathoms water on it, lies 97° , 4 miles from the lighthouse, and at 114° , 1,400 yards from this bank, and 100° , $4\frac{1}{2}$ miles from the lighthouse is another with 11 fathoms water over it. Over all these shoals during spring tides there are heavy tide rips, and in bad weather overfalls resembling breakers.

Caution.—The attention of navigators is directed to the great change of variation between Belle Isle strait and Heath point, which, if not allowed for, has the tendency to set vessels toward Anticosti when they are bound southward through the strait. The difference in variation referred to is about 7 degrees.

Attention is directed also to the change in variation between the gut of Canso and Heath point, which is about 3 degrees. Between Cabot strait and Heath point the change is only a little more than 1 degree.

Soundings.—The following peculiarities in the soundings will be useful by giving warning to the navigator in case of his being uncertain of his position. The curves of 20 and 30 fathoms, which off East cape are, respectively, $\frac{1}{2}$ mile and $1\frac{1}{4}$ miles distant from the shore, turn abruptly southeastward, forming a projecting flat ledge off Heath point, from which in a 100° direction the 20 fathoms curve is $7\frac{3}{4}$ miles and the 30 fathoms curve is 13 miles distant, respectively. The curve of 50 fathoms, which off Table head is only about 4 miles from the land, is distant 23 miles 100° from Heath point. Southward of this point the curve of 50 fathoms turns westward, and it is only 8 miles distant 184° from Heath point, 6 miles 181° from Goose point, and $3\frac{1}{2}$ miles 181° from South point, while the line of 10 fathoms is

only $1\frac{1}{4}$ miles off South point with no danger southward of it. At 184° from Heath point the 30 and 50 fathoms curves are only $\frac{1}{2}$ mile apart. The 100 fathoms curve of soundings, from about 12 miles northeastward of Table head, leads to a position 91° , 45 miles from Heath point, whence it bends westward to a position 153° , 21 miles from Heath point, and thence takes a 282° direction.

Tides and tidal streams.—It is high water, full and change, at Heath point at 11 h. 20 m.; springs rise $4\frac{1}{2}$ feet, neaps $2\frac{1}{2}$ feet. The tidal streams at springs run strongly round the point to a distance of about 6 miles from the shore, the flood running between north and east-northeast, and the ebb between south-southeast and southwest; at a distance of 5 miles from the land the streams turn at $1\frac{1}{2}$ hours before high and low water on the shore, and run at a rate of about $\frac{3}{4}$ knot an hour. During neaps these streams are much modified both in rate and direction by the wind.

Winds.—Sometimes westerly winds converge from both sides of the island toward Heath point, and in the area between the junction of the winds and the land, generally for 5 to 8 miles eastward of the island, the winds are light and variable. Sailing vessels should not approach the island within this space.

The coast from Heath point turns abruptly northwestward and westward 3 miles to Wreck point, which is low and dark and has a limestone cliff 15 feet high close eastward of it.

West bay lies between these points and affords tolerable anchorage with offshore winds in 6 to 10 fathoms water; but the bottom is generally foul with occasional patches of sand and mud.

Cormorant point, 256° , 5 miles from Heath point, is a conspicuous steep slope of red clay 20 feet high, backed by wooded ridges which approach close to the shore. Between it and Wreck point is a shallow bight where there is a lobster factory, abreast which a break occurs in the limestone reef that elsewhere fronts the coast for distances varying from 100 to 800 yards. Foul ground extends $\frac{3}{4}$ mile from Cormorant point and is generally shown by breakers.

The coast from Cormorant point trends westward in a series of small bights separated by low points. **Goose point**, the next westward, is distinguished by a remarkable clump of trees $\frac{3}{4}$ mile northeastward of it. A lobster factory is situated $2\frac{1}{4}$ miles eastward of Goose point. The shore reef extends $1\frac{3}{4}$ miles off Goose point to the depth of 4 fathoms. Heath Point lighthouse open of Cormorant point, bearing 71° , leads clear of this ledge; but this bearing leads across the foul ground to the southward of Cormorant point. Therefore when rounding Cormorant point, Heath Point lighthouse must not be brought to bear eastward of 66° . At night when the light is visible, a good rule for rounding both Goose point and Cormorant

point, is not to get to the northward of the line of visibility of Heath Point light.

From Goose point westward the coast, at 4 miles inland, rises to a height of 300 feet, with occasional patches of swampy land and numerous ponds: the wooded ridges beginning at Cormorant point continue to South point. There is a hill 115 feet high $\frac{3}{4}$ mile to the northward of Goose point. Otter river, a small stream that boats can enter at high water, lies $1\frac{1}{4}$ miles westward of Goose point, and at 4 miles from the point is la Croix point. Two other small streams that boats can enter at high water, the western one known as Bell river, lie between la Croix point and South point.

Tidal streams.—Westward of Cormorant point the flood stream runs northwestward, and the ebb southeastward; but both the rate and direction are much influenced by the wind; occasionally the stream runs in one direction for the whole of a day. It may be said that generally the tidal streams are very variable.

South point, 270° , $16\frac{1}{2}$ miles from Cormorant point, is low and flat, with some small ponds just inshore of it, and no trees within $\frac{1}{2}$ mile.

Bagot bluff is a slight rise in the coast $\frac{3}{4}$ mile northwestward of South point. At 800 yards westward of the lighthouse a break in the shore reef occurs where boats can land in moderate weather.

A rock with 16 feet water on it lies within the 5-fathom curve, 268° , $2\frac{1}{2}$ miles from the lighthouse on Bagot bluff.

Light.—On Bagot bluff a hexagonal wooden tower 54 feet high, painted white with a red vertical stripe, exhibits, at 75 feet above high water, a flashing white light, showing 1 flash every 20 seconds, and should be seen in clear weather a distance of 14 miles.

The keepers' dwelling, painted white, is eastward of the lighthouse.

Fog signal.—During snowstorms and in thick or foggy weather a steam fog horn, situated 100 yards eastward of the lighthouse, is sounded for 10 seconds, with an interval of 50 seconds between the blasts. If the horn is out of order a whistle sounds similar blasts. Neither horn nor whistle are to be depended on, as in some conditions of the atmosphere the sound is inaudible at any serviceable distance.

The fog-signal building is painted white with a red roof.

Marine signal and telegraph station.—There is at this lighthouse a signal, telegraph, and ice-report station which is included in Lloyd's system.

The coast.—From South point to Southwest point, a distance of 56 miles, there is such a sameness in the character of the coast, that it is very difficult to distinguish one part from another. This coast is very low, but it begins to rise at Pavillon river, whence there is a

high ridge close in rear of the coast all the way to, and for some miles beyond, Southwest point.

Caution.—Unless absolutely necessary, it is very undesirable to close this part of the island, because the survey is very incomplete. Reefs extend 1 mile from the land, and are so steep that the lead gives little warning; great caution is therefore necessary, especially in thick weather or at night when in this vicinity. When Southwest Point light is in sight do not bring it to bear westward of 311° .

Box river, a small stream, lies 6 miles northwestward of Bagot bluff, and the entrance of Shallop creek is nearly 8 miles farther northwestward.

Telegraph station.—There is a telegraph office at Shallop creek.

Pavillon river.—At the entrance of Pavillon river, 11 miles northwestward of Shallop creek, there is a limestone cliff.

Salt Lake bay, 11 miles southeastward of Southwest point and 45 miles northwestward of Bagot bluff, has fine sandy beaches, inclosing lagoons or ponds, into which the tide flows.

Anchorage.—Off the middle of this bay, and with its northwestern point bearing 350° , distant $1\frac{1}{4}$ miles, there is very indifferent anchorage, in 7 fathoms, sandy bottom; but there is some foul and rocky ground about 2 miles southward of this position. There are $7\frac{1}{2}$ fathoms rocky bottom marked on the plan on the spot alluded to, and as there is probably less water between it and the southeastern point of the bay, vessels should not pass between it and the shore.

Telegraph station.—There is a telegraph office at Salt Lake bay.

Southwest point is a low, projecting mound of limestone, having a small cove on its northern side, which forms it into a peninsula. The land in the rear rises gradually to the summit of the ridge mentioned above. When the wind is offshore and the sea smooth, boats may land on a limestone gravel beach on the southern side of the point, as well as in the cove on the northern side. A reef extends about $\frac{1}{2}$ mile westward of the point, and the 50-fathoms curve is about 2 miles off, in the same direction. On the northern side of the point, and along the coast to Jupiter river, the cliffs rise perpendicularly from the sea.

Light.—Southwest Point lighthouse, a circular tower 90 feet high, painted white with two red horizontal bands, on the western extremity of the point, exhibits, at 94 feet above high water, a revolving white light which attains its greatest brilliancy every minute, and should be seen in clear weather from all directions seaward a distance of 15 miles. The lighthouse makes a conspicuous landmark by day.

Marine signal and telegraph station.—There is a marine signal and telegraph station at this lighthouse, which is included in Lloyd's system of reporting stations.

Ice report.—This signal station receives special reports on the ice and the state of navigation in the gulf in April and May, and communicates the information to vessels asking for it by signal.

Anchorage.—There is indifferent anchorage in the bay northward of the point in 12 or 13 fathoms, over a bottom of sand, gravel, and broken shells, with the point bearing 178° , distant $\frac{3}{4}$ mile, whence the cliffs eastward will be at the same distance; small vessels may lie closer under the point. Although sheltered from about northward, through eastward, to southward, it should be used only in case of necessity, as the holding ground is bad, and it is a dangerous place to be caught by westerly winds, which are preceded by a heavy swell.

The telegraph cable from Great Fox river is landed on the outer part of the western cove of this bay, and vessels should avoid fouling it.

Tides.—It is high water, full and change, at Southwest point at 1h. 55m.; springs rise 6 feet, neaps 4 feet.

The coast from Southwest point to Ellis bay has no other anchorage. From the cove on the northern side of Southwest point the coast turns sharply northward to Jupiter river, then trends in a general northeasterly direction. Reefs of flat limestone extend from it, in most parts fully 1 mile, with 10 to 12 fathoms water often close outside them. Vessels standing in must keep the lead going, and sailing vessels should tack in 17 fathoms.

Current.—With westerly and southwesterly winds, a southeasterly current appears to sweep round the long bight between the West and Southwest points and to be turned off to the southward by the last-named point, frequently causing a great ripple off it.

Jupiter river, the largest stream on the island, is entered at $5\frac{1}{2}$ miles northward of Southwest point. There is a depth of 5 to 6 feet of water in its entrance after the melting of the snows in spring and 3 feet during the remainder of the year. Small boats can enter the river without difficulty and scows can be towed up far into the interior of the island. Sometimes in southwesterly gales the entrance becomes barred with sand, but it soon reopens. The river is a succession of pools and rapids, and has been explored to its source, about 100 miles from the entrance, where the quantity of water is nearly as great as at its mouth. Immediately northward of the entrance of this river there are conspicuous and high sandy cliffs.

St. Mary cliffs, 21 miles northwestward of Southwest point, are of sand, and though not high nor remarkable, are yet not difficult to distinguish.

Becscie river, 7 miles northwestward of St. Mary cliffs, is a small stream at the head of a cove, affording shelter to boats. One family resides there.

Telegraph station.—There is a telegraph office at Becscie river.

Ellis bay, 11 miles northwestward of Becscie river, has its entrance between capes Eagle and Henry, which are nearly 2 miles apart northwest and southeast, and it extends about 2 miles northward, thence about $\frac{1}{2}$ mile northwestward. Reefs of flat limestone, which dry at low water, and upon which the sea breaks with the least swell, extend about 1,200 yards westward of and around cape Eagle, and about 1,600 yards southward of cape Henry. From these reefs extensive flats continue round the bay, and though they do not entirely dry at low water, have upon them bowlders that always show.

The entrance between the reefs is 1,000 yards wide, having a least depth of 3 fathoms, and the bay affords the only tolerably sheltered anchorage with the best harbor in Anticosti.

The settlement on the shores of the bay within the pier is likely to become the chief place in the island; it now contains, besides a saw-mill and a lobster factory, the residence of M. Menier, the proprietor of the island; it has a complete telephone system. The soil about the settlement is very fertile. Good crops of oats, barley, and wheat have been reaped, and a large, flourishing fruit and vegetable garden has been established. A road connects the settlement with English bay.

A river formerly ran into the head of the bay, but its course has been changed and it now runs through a canal that has been cut and reaches the bay near the pier that has been built within the last few years.

Telegraph station.—There is a telegraph office at Ellis bay.

Beacons.—Two white beacons, close together, are on the western side of White cliff, which lies northward 1.6 miles from cape Eagle. The southern beacon is a cylinder with a conical top, the northern beacon a frustum cone; and the beacons in line bear 6° .

Two white beacons, close together, are situated at about a mile northward of White cliff. The southeastern beacon is a diamond shape on a post, and the northwestern, a square shape on a post. These beacons in line bear 342° .

Range lights.—The proprietor of Anticosti island, Mr. Menier, has established range lights for Ellis bay.

The front light is shown from a white cylindrical tower, 33 feet high, surmounted by a circular metal lantern with red roof. The tower is built upon a white concrete foundation in the form of a frustum of a cone, located on the western end of the breakwater pier built out from White cliff.

The light is a fixed white light, 35 feet above high water, and visible in clear weather 11 miles, over an arc of 90° from 307° to 37° .

The rear light is shown from a tower similar to the front one, but 52 feet high, built on a masonry foundation 10 feet high, in the form

of a frustum of a cone, located on land near the shore at the head of the bay, 5,000 feet, 243° , from the front tower.

The light is a fixed white light, 79 feet above high water, and visible in clear weather 14 miles, over an arc of 90° from 280° to 10° .

The two lights in line bearing 243° lead into Ellis bay clear of shoals.

Anchorage.—Vessels with a draft not too great for a depth of 3 fathoms may safely lie in the bay during June, July, and August, but they should moor with a long scope of cable on the southern anchor. If of greater draft and remaining only a few hours, or a day, they will find anchorage farther out, in $3\frac{1}{2}$ and 4 fathoms; but neither the ground nor the shelter is so good as that farther up.

A good berth is in 3 fathoms, muddy bottom, distant about 500 yards from the flats on either side, and about $\frac{1}{2}$ mile from those at the head of the bay, with cape Henry bearing 223° , and a little westward of the line of the lights at the head of the bay. This position is open from about south-southeast to south-southwest, but strong winds from this direction are rare and never last long. When they do occur, the sea, though very heavy in the entrance between the reefs, is much less at the anchorage.

The intersection of the lines of the beacons and the lights marks a good outer anchorage in the depth of $4\frac{3}{4}$ fathoms.

Breakwater pier.—A breakwater pier, 3,476 feet long, extends from the eastern shore of the bay northward of White cliff. The pier is now of such a length that vessels drawing 12 feet can moor alongside at low water, but it is to be lengthened so that vessels drawing 20 feet can moor alongside at low water. Vessels rounding the head of the pier to moor should leave the front range light on the starboard hand. A narrow-gauge railway connects the pier with the stores.

Boats can land on the shores of the bay only near high water. The best landing place is near the houses to the southeastward of the rear range light.

Directions.—As cape Henry is a bluff point and the land at the head of Ellis bay is very low, the entrance to the bay shows very distinctly, and can easily be made out from a distance seaward. On approaching the bay, cape Eagle and White cliff on the eastern side, the houses near the head of the bay and the range-light towers will be recognized, while far back in the country to the northward and eastward will be seen two ridges of hills. Though the long line of breakers on either side and the numerous large stones on the flats do not present an inviting appearance, no danger will be encountered if the following directions are observed:

From the westward, with westerly winds, run down outside of the reefs off cape Henry, keeping in 10 fathoms, until the two beacons

on White cliff are in line, bearing 6° ; then haul up with this range on, which leads into smooth water, of about $4\frac{1}{2}$ fathoms, 500 yards from Cape Henry reef. When the range lights at the head of the bay are in line, bearing 343° , proceed up the bay, keeping the range lights on, and anchor in 3 or $3\frac{1}{4}$ fathoms, a little to the westward of the range lights, or, if desired, on the range with cape Henry, bearing 223° . From the southeastward, with an easterly wind, keep outside the reefs, not closing Cape Eagle reef to a depth of less than 7 fathoms. When the range lights at the head of the bay are in line, proceed up the bay with this range on, and anchor as above directed. If desired to take the outer anchorage, follow the above directions to the intersection of the line of range beacons with that of the range lights, or vice versa, and anchor at the intersection in $4\frac{1}{2}$ fathoms, or stand 300 yards above the intersection on the line of range lights and anchor a little to the westward of the other range, in 4 fathoms, with the south tangent of cape Henry 271° . With either westerly or easterly winds, take care not to go too near the lee side of the channel, nor approach the reefs closer than 3 fathoms.

Tides.—It is high water, full and change, in Ellis bay at 2 h. 0 m.: springs rise 6 feet and neaps 4 feet.

Supplies.—Fresh beef, bread, and vegetables can be obtained at Ellis bay, and are delivered at the pier at the following prices: 1907—beef, $6\frac{1}{2}$ d. (13.7 cents) per pound: bread, $1\frac{1}{4}$ d. ($2\frac{1}{2}$ cents) per pound: vegetables, $1\frac{1}{2}$ d. (3 cents) per pound: fresh water, ice, bait, and fisheries stores can also be obtained.

The coast from cape Henry to West point, trending northwestward $7\frac{1}{4}$ miles, is bordered by reefs extending off about $1\frac{1}{4}$ miles, and should be approached with caution. Navigators must keep the lead going and pay close attention to the soundings.

West point is low and wooded, with reefs extending 1 mile off it, and may be passed in 15 fathoms water at the distance of $1\frac{3}{4}$ miles.

Light.—On West point a circular stone tower, 109 feet high, painted white, with two red vertical stripes, exhibits, at 112 feet above high water, a fixed white light, which should be seen in clear weather a distance of 15 miles. The keeper's dwelling is attached to the lighthouse.

Fog signal.—During thick or foggy weather and in snowstorms an explosive fog signal is fired every 15 minutes: if a vessel's fog signal is heard in dangerous proximity an additional signal is fired and repeated every 5 minutes.

Marine signal and telegraph station.—There is a marine signal station, which is included in Lloyd's system of reporting stations, at the lighthouse. It is also a telegraph and ice-report station.

English bay is about $1\frac{1}{2}$ miles northeastward of West point. It contains a settlement of about 250 inhabitants, situated in the middle of a clearing some 100 acres in extent. The settlers occupy well-built two-story wooden houses. The settlement contains a sawmill, with planing and grooving plant, and lathes; a blacksmith's shop; carpenters', wheelwrights', tinsmiths', and plumbers' shops. The artisans build very good whaleboats about 25 feet long, of French type.

Pier.—In the bay there is a pier, about 200 yards long, having, at low water springs, 4 feet water at its outer end. There is a flagstaff within the pier.

Beacons—Lights.—On the pier two beacons, consisting of white disks on posts, in line 143° , lead clear of, but close to, the reefs on the western side of the bay. There are two fixed lights on the pier, the inner green and the outer red.

Anchorage.—Vessels anchoring should keep eastward of the line of the beacons, with the beacons a little open. If of deep draft, stand in on the line of the beacons until the base of West Point lighthouse is in line with high-water mark on the point northward of the lighthouse. A third-class cruiser anchored in 10 fathoms, with the beacons in line 143° , and an overhanging bluff 73° . The pier lights in line mark the anchorage for the steamer which runs about once a week to Quebec.

Caution.—As the surveys in this region are very incomplete, the chart must be used with great caution.

Telegraph station.—There is a telegraph office at English bay.

North coast.—The north coast between West and North points, trending about 79° , a distance of about 16 miles, is low, with reefs of flat limestone extending 1 mile off it. There are moderate depths for over 1 mile outside the reefs, but the reefs should not be approached nearer than a depth of 25 fathoms. At a mile or two inland, and about midway between West and North points, are the two hills or ridges mentioned as landmarks for Ellis bay.

Beacon.—A conspicuous open framework white tower, used for surveying purposes, is situated about 67° , 2.6 miles from West Point lighthouse.

North point is wooded, of moderate height, and without any cliff: it can be distinguished only by the change of direction of about two points in the coast line which takes place at it.

Current.—Off the coast, between West point and North point, there is sometimes, during westerly winds, an easterly current with a rate of $\frac{1}{2}$ mile—seldom more. This current may be imperceptible during the westgoing tidal stream: and upon the approach of easterly winds it may set westward. The current off North point with westerly

to southwesterly winds generally sets northeastward at a rate of about 1 mile during the eastgoing stream and of about $\frac{1}{2}$ mile during the westgoing stream in the offing.

High Cliff point, about 105° , 13 miles from North point, is noticeable from having a talus (a sloping heap of fragments of rock) in front of it, or between it and the sea, which therefore does not reach the actual base of the cliff.

The coast from High Cliff point to West cliff, about 107° , 26 miles, is low; but there are ridges of considerable elevation a few miles inland. From this coast, reefs extend about $1\frac{1}{2}$ miles to seaward, beginning about 1 mile eastward of High Cliff point, and continuing for about 10 miles eastward, whence to West cliff they reach only about 1 mile from the land. The soundings about a mile seaward of the reefs vary from 5 to 44 fathoms until near West cliff, off which, at the distance of $1\frac{1}{2}$ miles from the surf, there are 72 fathoms.

West cliff, appearing like a white patch on the land, is remarkable, for there is no other high cliff near it. It can be seen from a distance of 20 miles.

The coast from West cliff to Bear head, trending in a general east-southeasterly direction, is bold, the 100-fathom curve being from $4\frac{1}{2}$ to $7\frac{1}{2}$ miles distant. The coast has numerous small bights and headlands; but offers no anchorage except two mentioned below. Low cliffs commence 4 miles southeastward of West cliff and continue to Charleton point, which is 10 miles, 107° , from West cliff. About 5 miles southeastward of Charleton point, the coast turns south-southeast for $2\frac{1}{2}$ miles and then trends almost due east for 3 miles to cape Observation.

In the bight just southeastward of Charleton point, where wood and water may be obtained, there is anchorage during fine weather with westerly winds.

Cape Observation, 115° , 10 miles from Charleton point, is a bold, high headland having just westward of it a range of grayish white cliffs some 400 feet high. At the extremity of the cape these cliffs become suddenly much lower, and then rise again to their former elevation for a short distance eastward of the cape. Under the lee of cape Observation during westerly winds and fine weather there is anchorage, where supplies of wood and water may be obtained conveniently.

Bear head, composed of grayish white cliffs 400 feet high, lies $12\frac{1}{2}$ miles, 122° , from cape Observation, which it somewhat resembles. The two may be distinguished from each other by the fact that to the westward of the vicinity of Bear head there are some cliffy headlands about as high as Bear head, while there are no such headlands

to the westward of cape Observation. The intervening coast is of the same character as Bear head, and is bold, with small bays between the cliffs. Guy point is the cliff about 4 miles to the northwestward of Bear head.

Bear bay, lying between Bear head and cape Robert, which is nearly 6 miles, 130° , from the former, is by far the best roadstead on the north coast of Anticosti. It is sufficiently roomy, with excellent holding ground, in a moderate depth of water, and is sheltered from northwest, through west and south, to southeast.

Cape Robert consists of cliffs similar in height and color to those of Bear head. Within the bay there are two other points of cliffs 300 feet high, the southern of which is Tower point.

Bear bay is divided into three smaller bays by these two high points. In each of these bays there are fine bold beaches of sand and limestone shingle, and streams where water can be easily obtained. The principal of these streams is Bear river, which enters the southern of the three bays, close southeastward of Tower point; it is too shallow and rapid to admit boats, but the water is clear and good. The cliffs in Bear bay are of grayish white limestone, in thin strata, dipping very slightly to the southward, and are perpendicular or overhanging. At the extreme points the cliffs are rounded by the action of wind and water so as to resemble towers, a resemblance that is increased by the masonrylike appearance of the rock.

The trees about the bay are of diminutive growth.

Anchorage.—The best anchorage is between Tower point and cape Robert, in 13 fathoms, brown mud, with Tower point bearing 285° , distant 1 mile, and Bear head 322° .

The coast from cape Robert to Table head, 18 miles distant, trends in a general southeasterly direction. It is broken into small bays with shingle beach and small streams between high headlands that terminate at the sea in perpendicular cliffs. The principal of these headlands are cape Henry, 400 feet high; Joseph point, and cape James, 150 feet high.

None of the bays, except Prinsta (described below) afford good anchorage.

Prinsta bay, immediately northwestward of Table hill, has excellent anchorage at its head in 5 to 9 fathoms water—bottom clay or mud—and sheltered from all winds from north-northwest, through west, to east-southeast.

Water can be obtained from a stream which flows into the southeastern corner of the bay.

Tidal streams.—Between West cliff and Table head there is generally very little stream in either direction.

Table head, 117° , 18 miles from cape Robert, rises to Table hill, a densely wooded summit 260 feet in height, but having very little resemblance to a table. A limestone ledge extends $\frac{1}{4}$ mile off the head, and the 5 fathoms curve is 800 yards distant from it.

The coast from Table head trends 136° , $3\frac{1}{4}$ miles to Fox point, and has a flat reef extending about $\frac{1}{2}$ mile from it. Nearly midway between Table head and Fox point a break in the reef affords, at low water in moderate weather, sheltered landing for boats. At a distance of 2 miles from the coast thickly wooded ridges, rising to a height of 220 feet, extend southward; the space between the coast and the ridges alternating in swamps and patches of dense wood.

Fox bay, $1\frac{1}{2}$ miles southward of Fox point, is about 1 mile wide and deep, with a sandy beach at its head, where there is a stream draining the ponds and swamps mentioned above. The north shore is foul for a distance of 600 yards and the south shore for 400 yards. In the middle of the bay there are depths of $2\frac{1}{4}$ to $2\frac{3}{4}$ fathoms, the latter over a muddy bottom; the space is fairly well sheltered from the sea by the shoals fronting the bay and affords anchorage to the small fishing vessels frequenting this vicinity in summer. It is said to afford good anchorage also to vessels drawing up to 15 feet.

On the southern shore of the bay are situated the telegraph office and the houses of about 10 resident families, while on the western shore, on a bank of gravel which lies between the bay and a fresh-water lake, is the lobster canning establishment, comprising factory, stores, etc.

Reef point, the southern entrance point of Fox bay, is low and flat, and behind it are several lagoons and swamps. Shoal water extends from the point northeastward $\frac{3}{4}$ mile to the depth of 3 fathoms; and close beyond it is a detached shoal $\frac{1}{2}$ mile long and 400 yards broad, with 9 feet on it at low water. The whole of the summit of the ridge on Table head open northward of Fox point leads close eastward of this shoal.

Supplies.—Bait, ice, fishing supplies, and provisions can be obtained at Fox bay.

Telegraph station.—There is a telegraph office at Fox bay.

The coast from Reef point to East cape trends southeastward 10 miles, and is of limestone cliffs 100 feet high, but with reefs and foul ground extending off it in some places.

Wreck point is 3 miles southward of Reef point, the intermediate coast forming a small bight, which does not afford anchorage. The shore reef extends more than 200 yards from the point, and foul ground extends southward 1 mile.

At $1\frac{3}{4}$ miles inland the ridge back of Wreck point rises to a wooded summit 316 feet high with a bluff at its northern end; and a little southward of the high summit are two remarkable detached summits on the ridge extending toward East cape. This is the most conspicuous land in the southeastern part of the island.

Cape Sandtop, 2 miles southward of Wreck point, is a remarkable headland rising steeply to a height of 120 feet, and is composed of marl and gravel that from seaward resembles white sand.

There is no secure anchorage in the bight between Wreck point and cape Sandtop.

The coast.—Southward of cape Sandtop the limestone cliffs continue to a conspicuous perpendicular bluff, 116 feet high, and from this they fall gradually toward East cape, forming Gull Cliff bay, a small bight, in which there is anchorage with westerly winds in 10 to 12 fathoms, over sand and rock.

Tidal streams.—Between Table head and East cape there is an almost constant stream setting southward, with an occasional weak eddy close to the shore setting northeastward.

CHAPTER III.

GUT OF CANSO—CAPE BRETON ISLAND, WEST COAST—GEORGE BAY.

VARIATION IN 1908.

Eddy Point-----	23° 10' W.	Chetican Point-----	24° 30' W.
Cape George-----	23° 15' W.	Cape North-----	25° 15' W.

General remarks.—In the first chapter a general description of, and general directions for, the gulf of St. Lawrence were given. In the second chapter the islands in the gulf were specifically described. In the present and following chapters it is intended to describe, first, the southern entrance and shores of the gulf and estuary, and then the northern. After this the shores of the river will be taken up.

The above would seem to be the best arrangement, because the descriptions and directions come in their logical order.

Cabot's strait, the middle and main entrance to the gulf, needs no special description, and general directions for it were given in the first chapter.

The southern and eastern coasts of Cape Breton island are described in Hydrographic Office publication No. 99, "Bay of Fundy, Southeast Coast of Nova Scotia, and South and East Coasts of Cape Breton Island." The approaches to the gut of Canso and the gut itself are described in the same publication. It is well, however, to describe in the present work the gut of Canso, because it is so intimately connected with the gulf of St. Lawrence.

GUT OF CANSO.

The gut of Canso, separating the mainland of Nova Scotia from Cape Breton island, and forming the southwestern entrance of the gulf of St. Lawrence, is of great and increasing importance in the navigation of that gulf and its tributary waters. The number of vessels annually passing through the gut amounts to several thousand, and is constantly increasing with the trade and population of the neighboring countries. Not only do the numerous fishermen, coal traders, and coasting vessels to and from the ports of the United States, New Brunswick, Newfoundland, and Nova Scotia, use this passage, but also many vessels trading between Great Britain and

the southern parts of the gulf of St. Lawrence. It is by far the best route for these last, if they are sailing vessels, especially when homeward bound in the fall of the year, as it affords them safe anchorage until an opportunity offers for sailing with the first of a northerly or westerly wind, thus securing a safe offing before the occurrence of the thick weather which almost always accompanies winds from the contrary quarter.

The length of the passage through the gut, from the lighthouse on Eddy point at the southeastern entrance to the lighthouse at the northwestern entrance, is $14\frac{1}{2}$ miles, and its least breadth, between Balache point and cape Porcupine, is 900 yards. The depth of water in the channel is less than 15 fathoms in only a few places, and in the deepest part, off cape Porcupine, it reaches 31 fathoms. This great depth, the rapidity of the tidal streams, and the rocky or gravel bottom, render anchorage unsafe, except at the places herein described.

The coast.—Except for a short distance northward of Port Hawkesbury and at Ghost beach, the character of the shore on either side is high, the land rising from it more or less abruptly, to the summits of ridges of considerable elevation. Cape Porcupine, a precipitous headland on the western shore, 640 feet high, is the most remarkable feature, and the scenery in its vicinity is of great beauty. The shores on both sides of the gut are generally bold, but there are several small rocks and shoals at no great distance off the land. There are settlements on each side that are increasing, especially at the several anchoring places, where supplies may be obtained.

The rocks, forming the shores on both sides, belong to the lower members of the coal formation, and are slates, conglomerates, sandstones; sometimes containing fossils, gypsum and gypsiferous marls, with occasionally carboniferous limestone. This last, containing fossils, is well displayed at Port Hastings, where there are also large beds of white gypsum, which at once point out that anchorage.

Caution.—As the soundings are sparse, vessels should approach either shore of the gut with caution.

Ice.—Owing to ice, navigation is suspended from about the beginning of January to the end of April.

Eddy point, the southern entrance point to the gut, is of sand and gravel, inclosing a small pond.

Light.—A square lighthouse, 44 feet high, painted white with a black diamond on the seaward side, and with a red lantern, on Eddy point, exhibits, at 55 feet above high water, a fixed white light, which should be seen in clear weather a distance of 12 miles.

A dwelling is attached to the lighthouse.

Fog signal.—A hand horn answers vessels' signals.

Eddy spit, of sand and stones, extends $\frac{1}{4}$ mile northeastward from high water mark on Eddy point; it is almost always shown by the rippling of the tidal stream.

Buoy.—A large black can buoy is moored in 9 fathoms close northeastward of the spit.

Clearing mark.—Ship point and Bear island in line, bearing 302° , leads about 200 yards northeastward of the shoal.

Martin shoal, of rock; extends nearly 350 yards off the western shore of the gut, 2 miles 286° from Eddy point.

Clearing mark.—Melford and Critchet points in line, bearing 301° , leads just outside its edge, in 4 fathoms.

Bear head lies 314° , $2\frac{1}{4}$ miles from Eddy point, and is the southeastern entrance point of the gut. Shoal water extends nearly 400 yards southeastward of it.

Bear island, situated $\frac{1}{4}$ mile westward of the head, is connected to the shore eastward of the island by a shingle spit.

Light.—From the middle of Bear island, a square wooden lantern rising from the roof of a square wooden dwelling, 35 feet high, exhibits, at 42 feet above high water, a fixed red light, which should be seen in clear weather a distance of 8 miles. The dwelling and the lantern are painted white, with red roofs.

Bear reef extends nearly 300 yards southward from Bear island, and has 3 to 15 feet at low water over large rocks.

Caution is necessary in approaching these shoals, for the water is deep near them, and there are no good clearing marks.

Anchorage.—At Critchet cove, between Park and Critchet points, on the western shore of the gut, and $1\frac{1}{2}$ miles westward from Bear head, there is a shallow bank of mud and sand, on which small vessels frequently anchor, but of which vessels of deep draft should beware. Its outer edge, in 5 fathoms, is near $\frac{1}{4}$ mile offshore.

Ship rock, with 6 feet least water over it, is 140 yards off the eastern shore of the gut at 2.1 miles 302° from Bear island and $\frac{1}{4}$ mile same bearing from Ship point.

It is marked by a spherical steel buoy painted red. This buoy must be left on the starboard hand by vessels proceeding northward through the gut, and on the port hand by those proceeding southward.

Clearing mark.—Ship point and Bear head in line, bearing 120° , leads 40 yards outside the rock, and, therefore, in standing toward it from the north, tack before the head and point are in line. In standing through the gut from the south the buoy must be the guide. It will, of course, be visible before the vessel can get in any danger.

Anchorage.—There are indifferent anchorages, either open to certain winds or with loose holding ground, in Eddy, Critchet, and Byers coves; eastward of Bear head; northwestward of Bear island; off Doolan pond and Madden cove, and in Pirate or Holland cove, where vessels frequently wait for wind or tide in fine summer weather, and to which the chart is the guide.

Cahil rock, which dries at low water, lies 120 yards off the western shore of the gut, nearly $2\frac{1}{2}$ miles northwestward of Critchet point and $\frac{3}{4}$ mile southeastward of Holland cove.

Clearing mark.—Roger point in line with the northeastern side of Pirate island (which is seen over the low shingle rock of Pirate point), bearing 301° , leads 120 yards outside the rock.

Madden point is on the eastern side of the gut, $2\frac{1}{4}$ miles northwestward of Ship point. The western terminus of the Cape Breton railway to St. Peter is situated on the point, but a branch connects with the Intercolonial at Port Hawkesbury.

Wharf.—A railway wharf has been built out 260° 200 feet into the gut at 200 yards southward of Madden point, and it is reported that vessels drawing 20 feet can go alongside its outer end.

Point Tupper, about 1,400 yards northwestward of Madden point, is the southern entrance point of Port Hawkesbury.

Light.—A square white lighthouse, 34 feet high, with a dwelling attached, situated 147 feet back from point Tupper, exhibits at 54 feet above high water a fixed red light that should be seen in clear weather a distance of 7 miles.

Shoal.—A rocky shoal, with less than 16 feet of water, extends 300 yards southward from point Tupper. The edge of the shoal is steep, and the depth off it increases almost immediately to 5 fathoms.

Railway ferry.—The Cape Breton branch of the Intercolonial railway has its western terminus at point Tupper, where a large group of wharves has been built immediately southward of the lighthouse. These wharves have a frontage of about 500 feet and extend about 400 feet into the gut; upon them is built the railway station and sheds, the whole forming a conspicuous mark.

From point Tupper the ferry crosses to the terminus of the mainland branch at Murray cove. The Scotia, the double-ended railway ferry ice-breaking steamer, is constructed to carry, on three sets of rails on deck, 9 railway sleeping cars, each 80 feet long and weighing 52 tons unloaded.

The railway ferry is open throughout the year.

Hospital.—A marine hospital is maintained at point Tupper.

Port Hawkesbury is a large cove, terminated by a bridge nearly 1 mile from its entrance. There is a settlement, with two chapels,

on the northeastern side of the harbor, and there are stations of the Intercolonial and the Inverness and Richmond railways.

Vessels winter at the wharves in safety.

In 1901 the population of the settlement was 633.

The United States is represented by a consular agent.

Premier shoal, with 12 feet least water, soft mud, is a middle ground in the entrance of the port. It may be passed on either side, but the wider and deeper channel is northward of it.

It is reported (1904) that the least water on this shoal is $3\frac{1}{2}$ fathoms, and that it is so soft that vessels go over it if desired.

Clearing mark.—Point Tupper and the western end of Pirate island in line, bearing 191° , leads westward of the shoal in 5 fathoms. This mark is useful only to vessels desiring to anchor. Those passing through would not be so far to the eastward.

Anchorage.—The roadstead off the mouth of this harbor, and outside Premier shoal, is much frequented by vessels detained by southeasterly winds. The depth in the roadstead is from 7 to 9 fathoms, over sand, gravel, and mud bottom, with Pirate island open westward of point Tupper.

This anchorage is open to northwesterly winds, which blow directly through the gut, causing at times a heavy sea, with very rough riding. There is quite secure anchorage well in toward the head of the harbor, in $3\frac{1}{2}$ fathoms, out of the tidal streams.

Prohibited anchorage.—Anchorage is prohibited between point Tupper and Murray cove in the track of the railway ferry.

Ice.—The port is usually frozen over about the 3d of February, and clear of ice about the 23d of April, being completely closed only at intervals between those dates. Field ice comes in and disappears about the same dates as the harbor ice. The first vessel arrives about the 5th of April, and the last one leaves about the 22d of December.

Directions.—Vessels of less than 12 feet draft may enter Port Hawkesbury without difficulty, passing over Premier shoal at all times; but vessels of deeper draft should use the channel northward of that danger, and proceed as follows:

From outside of the shoal bring Kavanagh point, a low sandstone and sandy beach on the northeastern side of the harbor, to bear 117° , when a large store built on piles, farther up the harbor, will be in line with it, and the end of the wharf off the settlement will be just in sight. Run in with these marks on until point Tupper bears 124° , when the vessel will be within Premier shoal, and may steer to the southward into the middle of the harbor. The channel southward of the shoal is neither so deep nor so wide as that northward, but it is more convenient for sailing vessels with southerly winds, in which case the chart and the lead will be sufficient guides.

Repairs.—At Port Hawkesbury there are three marine railways, which can take vessels of 1,000, 200, and 130 tons, respectively. The largest is 200 feet long, 45 feet wide, and at high water ordinary springs has 20 feet of water over the cradle.

Quarantine.—Port Hawkesbury is a minor quarantine station.

Communication.—Besides communication by railway and telegraph, Port Hawkesbury has communication twice a week with Pictou by steamer.

Pirate or Holland cove.—**Pirate island**, small, rocky, and united to the mainland by a beach of shingle, forms the southeastern point of Pirate cove; and all within the island and a line drawn across to the wharves on the northwestern side of the cove is dry at low water, except a narrow boat channel, carrying 3 feet of water, which leads to the bridge across the cove at the head of the port, and about $\frac{1}{4}$ mile from its entrance.

The anchorage in this cove, although deep enough, is inconveniently small for large ships, but safe and good for small vessels. The best berth for anything larger than a fishing schooner is in 7 or 8 fathoms, mud bottom, with the northeast tangent of Pirate island bearing 123° , distant 200 yards.

Port Mulgrave is on the western shore of the gut, opposite point Tupper. The settlement contains a small English church. Vessels passing are reported by telegraph.

Murray cove is the southern cove of Port Mulgrave.

Venus cove, the northern cove of Port Mulgrave, is a good watering place, has wharves for landing at all stages of the tide, and affords excellent anchorage, especially in northwesterly winds. The best berth is in 6 to 7 fathoms, mud, directly off the mouth of the cove, with Macnair point 400 yards distant and in line with Port Hastings, bearing 348° .

Railway—Wharves.—Port Mulgrave is connected with the railway system of Canada by the Intercolonial railway. Wharves, together with a railway station, have been built on the southern side of Murray cove; the railway ferry crosses to these wharves.

Coal can be delivered to vessels at the wharves at Port Hawkesbury and Port Mulgrave, but there are no special facilities for such service.

Port Hastings (Plaister cove), on the eastern shore, and 2.4 miles northwestward of Port Hawkesbury, is the first safe anchorage after entering the gut from the northward. On its northwestern side, and a short distance back from the bridge near its entrance, there are conspicuous cliffs of white gypsum, 120 feet high. The head of the port, which forms a cove, is dry at low water.

The town contains a post-office, a large and noticeable telegraph office, whence electric cables cross the gut to the mainland, and a station of the Inverness and Richmond railway. There is a conspicuous church just westward of the port.

Notice boards, warning vessels not to anchor near the line of the cables, are erected on Balache point and cape Porcupine.

Storm signals are exhibited at Port Hastings.

Dixon rock, said to have 6 feet water over it, but on which not less than 12 feet was found, bears 157° , 140 yards from Mackeen point, and 236° , 240 yards from the western point of Port Hastings.

Anchorage.—The anchorage at Port Hastings is convenient and safe in all winds. In northerly gales the swell, deflected by cape Porcupine, causes rather uneasy riding, but it does not endanger vessels well anchored in a clear berth.

Piers.—At the port the Inverness and Richmond Railway Company have constructed a coal-shipping pier for steamers, with the railway running on it. There is an inner pier for schooners.

Directions.—To avoid Dixon rock and choose a good berth, keep the cove open, so that the whole of the bridge, as well as the white cliffs above it, are visible. In anchoring a large vessel, keep Balache point well open, and do not go into less than 7 fathoms water; but small vessels may anchor in 4 to 5 fathoms, with mud bottom. The bottom becomes sandy out toward the steep edge of the bank in 10 fathoms, after which it is rocky in the deep water and strength of the tidal streams.

The tidal eddies render it advisable to moor, especially in large vessels making any stay, in which case one anchor should be placed well to the southward, in 9 to 10 fathoms water.

Tides and tidal streams.—It is high water, full and change, in Port Hastings at 9h. 10m.; ordinary springs rise $4\frac{1}{2}$ feet, neaps 3 feet; extraordinary tides sometimes rise 6 to 7 feet, and at other times only 2 feet.

The tidal streams at this anchorage are eddies, often running irregularly, but generally in a contrary direction to the main stream in the channel, and at a rate seldom exceeding 1 knot.

Coal can be obtained at Port Hastings, but there is no information as to the quantity.

Water.—There is an excellent watering place on the western shore of the gut, in the bay between Keaton point and cape Porcupine.

Balache point is on the eastern side of the gut, $\frac{1}{2}$ mile northward of Mackeen point.

Balache rock, which nearly dries at low water, lies in the bay between these points, 200 yards eastward of Balache point and 100 yards offshore.

Light.—From a white square wooden tower 32 feet high, on Balache point, is exhibited, at an elevation of 44 feet above high water, a fixed white light, which should be visible in clear weather a distance of 12 miles.

Madagascar rock, dry at low water, lies not quite 100 yards off the western shore, under the highest part of cape Porcupine, with Balache point bearing 12° . The rippling of the tidal stream over this rock can generally be seen: nevertheless, its situation, off a projecting point in the narrowest part of the passage, nearly in the full strength of the tide, and at a place where sudden flaws of wind from various directions are frequent, renders it very dangerous, and it should be given a wide berth.

Mill creek is on the western shore 159° , nearly 1 mile from Balache point. Vessels occasionally anchor off the creek in fine weather, but the anchorage is open to northerly winds, which often commence suddenly and send in a heavy sea: and irregular eddies render it difficult to keep a clear anchor.

The shores.—The eastern shore of the gut trends about north-northwestward from Balache point for 4 miles to Heffernan point, and the western shore about northwestward from Mill creek for $4\frac{1}{2}$ miles to North Canso lighthouse.

Light.—North Canso lighthouse, a square, white building, 35 feet high, 120 yards back of high water mark at the western side of the northern entrance of the gut, and about 4 miles northwestward of Balache point, exhibits, at 110 feet above high water, a fixed white light that should be seen in clear weather a distance of 16 miles. From the westward the light is obscured over Jack shoal, or when bearing eastward of 121° , by trees.

Anchorage.—Under the lighthouse and within $\frac{1}{2}$ mile southeastward of it there is tolerable anchorage in all but northerly winds.

Use of chart.—In the foregoing remarks it has not been considered necessary to describe every point of land, nor to describe minutely those points and places that have been mentioned.

The chart is constructed on such a scale that it clearly shows detail and its use will enable the navigator to recognize and pass all places that have or have not been described.

Gut of Canso—Directions.—There is little difficulty in navigating the gut of Canso, either with a leading or a beating wind. When beating northward into the gulf, the aim should be to gain the anchorage at Port Hastings, and to start thence with the turn of the tide, so as to secure a good offing in George bay before the ebb makes. The chart will enable the navigator to plot the ship at all times during the day by bearings.

It is well to be careful concerning the tidal streams which are strong, and not let them get control of the vessel.

The distance across the bay from cape George, the northwestern point of George bay, to North Canso light, at the northwestern entrance of the gut, is $20\frac{1}{2}$ miles. The approach from the northward, through George bay, is unattended with difficulty or danger, excepting in fogs or snowstorms. The soundings are then the only guides, and they are sufficient in all ordinary cases. If possible, strike soundings on the bank off Long point, and then follow the edge of the bank along the coast of Cape Breton island, in the low water depth of 10 fathoms, to the entrance of the gut. The weather is seldom so thick, especially in a breeze of wind, that some part of the shore is not seen before the vessel has run far after entering so narrow a strait as the entrance to the gut.

With a beating wind, tack off and on the same shore, until soundings are struck (in the board to the westward, and after crossing the deep water) on the edge of the bank off cape Jack, where, if at night, and the fog so thick that the light is obscured, it is advisable to anchor and wait for a change. The ground there is not good, but it is out of the strength of the tides, and an anchor will hold in moderate weather. The anchorage, $\frac{1}{2}$ mile southeastward of the lighthouse and on the same side of the channel, should be preferred if attainable; it has some spots of mud in which an anchor holds well in 7 to 9 fathoms, and where the strength of the tide is not great.

Vessels proceeding southward through the gut very frequently meet a southerly or southeasterly wind, usually accompanied by fog and rain: in this case the roadstead off Port Hawkesbury is a roomy and convenient anchorage. Eddy cove, from its more advanced position at the southeastern entrance of the gut, offers, to vessels sailing with the first of a fair wind, a better chance of clearing Chedabucto bay and the Canso ledges before dark; but as the ground here is not good, and the anchorage is open to northerly winds, it is recommended only in fine, settled, summer weather. Turbalton bay is much more secure, but it is rather small for a large and weakly manned vessel to weigh from, should a strong wind set in suddenly from the westward.

Tides and tidal streams.—It is high water, full and change, at Bear head at 8h. 30m.; springs rise $4\frac{1}{2}$ feet, neaps 3 feet; and at the north entrance of the gut high water at 9h. 15m.; springs rise 4 feet, neaps 2 feet: in both places extraordinary tides may rise 6 to 7 feet, or only 2 feet. The rise and fall of the tides on the shore usually continue through nearly equal periods of time, but the turn of the tidal streams (the flood setting northward and the ebb southward) varies from 1 to 4 hours after high and low water on the shore.

The rate of the stream off cape Porcupine, where it is greatest, is ordinarily about 4 knots, but occasionally it reaches 5 knots. At most

of the anchorages, and under almost every point in the gut, there are eddies usually running in the opposite direction to the main stream outside, but at a much inferior rate. and they render great attention necessary to insure a clear anchor.

The set of the flood stream from the northern entrance of the gut is nearly toward cape George. diminishing rapidly in strength as it expands in width in advancing to the northward. In the western part of George bay it is weak, sweeping round the bay to the north-westward, with slight indrafts toward Pomquet. Antigonish, etc. The ebb stream sets in the contrary direction.

On the eastern side of George bay the flood stream from the gut is usually met by a much weaker and contrary stream of flood coming from the northeastward along the western coast of Cape Breton island. These opposing flood streams will be found in general to unite somewhere off the Judique shoals and then to set toward the northwest. Likewise in general the two corresponding ebb streams diverge from about the same place, the one setting toward the gut, with increasing strength as it proceeds to the southward and narrows, and the other setting in the contrary direction toward Port Hood and weakening. All, however, that has been said respecting these streams must be understood to be of usual and not of constant occurrence, since they must necessarily partake of the irregularity in the strength and duration of the tidal streams of the gut of Canso. Nevertheless. it will be very useful and may materially aid the progress of the vessel for the navigator to bear in mind the above.

GEORGE BAY.

NOVA SCOTIA.

George bay extends 18 miles northward from the gut of Canso, and its northern entrance, between Henry island and cape George, is $13\frac{1}{2}$ miles across. Its eastern shore is part of the southwestern coast of Cape Breton island. Its southern and western shores are parts of the northeastern coast of Nova Scotia. Its navigation is important, as it is traversed by the numerous vessels which pass in or out of the gulf by the gut.

Light.—North Canso lighthouse, a square. white building, 35 feet high. 120 yards back from high water mark at the western side of the northern entrance of the gut. exhibits. at 110 feet above high water, a fixed white light that should be seen in clear weather a distance of 16 miles.

Anchorage.—At the distance of $\frac{3}{4}$ mile southeast of the lighthouse and on the same side of the gut there is tolerable anchorage in all but northerly winds. Vessels frequently anchor there to await the tide.

Havre Bouche is a small but convenient harbor for schooners, lying 1.3 miles westward of North Canso lighthouse and between that lighthouse and cape Jack. It has a depth of 4 feet at low water in its narrow entrance between stony points and 13 to 14 feet within. There is a small stream at its head. The shores and neighborhood are well cultivated, and there is a church near the shore at 1 mile westward of the entrance or halfway toward cape Jack.

Lights.—A square, white lighthouse, 32 feet high, on the southwestern shore of Havre Bouche harbor, exhibits at 37 feet above high water a fixed white light.

A similar lighthouse at 193° , 473 yards from the above light, exhibits at 107 feet above high water a fixed red light. These lights should be seen in clear weather a distance of 9 miles, and in line lead through the dredged channel over the bar.

Tides.—It is high water, full and change, at Havre Bouche at about 9h. 30m.; springs rise 4 feet, neaps 2 feet; but the rise may be increased by northerly winds.

Cape Jack, a cliff of red sandstone, 45 feet high, 269° , nearly 2 miles from the western entrance point of Havre Bouche, is a prominent headland.

Jack shoal, extends from the cape, northward 1 mile to 3 fathoms water and $1\frac{1}{2}$ miles to 5 fathoms. Between $\frac{1}{2}$ and $\frac{3}{4}$ mile offshore there are two large patches of rock, which dry at half tide, leaving a passage, carrying 12 feet water, between them and the cape.

Caution.—Jack shoal is dangerous in thick weather, when it should be approached with great caution, especially from the eastward, as the soundings on that side are irregular and deep near the shoal, although sufficient to insure safety if the lead be kept going. The shoal should not be approached within the low water depth of 10 fathoms.

North Canso light is obscured by forest over Jack shoal, or when bearing eastward of 121° ; by keeping the light in sight, Jack shoal is given a berth of over a mile.

Buoy.—A conical, red buoy, with JACK SHOAL on it in white letters, is moored in $6\frac{1}{2}$ fathoms at 14° , 1 mile from Jack shoal.

Little Tracadie harbor, with only 1 foot at low water over its bar, lies $2\frac{3}{4}$ miles southwestward of cape Jack. Its entrance is in the bay between cape Blue and Barrio head, the former of which is of limestone and shelters the entrance from northeasterly winds, and the latter, a cliff of red sandstone 110 feet high.

Tracadie harbor, at $2\frac{1}{2}$ miles westward of Little Tracadie harbor, is separated from the bay by a series of islands and connecting beaches

of sand and gravel, and formerly had its entrance westward of Delory island through a narrow and crooked channel, with a depth of 2 feet in it at low water. In 1863 a passage was dredged on the eastern side of the harbor, through a beach which connected the mainland with Delory island, and a breakwater constructed on its eastern side. The channel admits only small craft; it had a depth of 6 feet at low water.

The harbor is extensive, with many coves, islets, and small streams, and has 14 feet water in some parts within. Tracadie river, the principal of the streams, is at the head of the eastern arm, $2\frac{1}{2}$ miles in from the sea.

Tides.—It is high water, full and change, at Little Tracadie and Tracadie harbors at about 9h. 30m.: springs rise 4 feet, neaps 2 feet; but the rise may be increased by northerly winds.

Tracadie village, which in 1891 had 440 inhabitants, has a church and a station of the Intercolonial railway, and is situated about 1 mile within the entrance of the harbor. The church, which is large, can be seen from some distance seaward.

The inhabitants of these small harbors, including Pomquet, are Acadians of French extraction, who live principally by agriculture, fishing to a limited extent during the herring and mackerel seasons.

Bowman bank.—Bowman head lies $1\frac{1}{4}$ miles westward of Middle head, the northeastern point of Delory island, and Quarry point is $1\frac{1}{2}$ miles southwestward from Bowman head. Bowman bank runs off $2\frac{1}{4}$ miles to the north-northwestward from between Bowman head and Quarry point: and at $\frac{3}{4}$ to $1\frac{3}{4}$ miles offshore there are rocky patches on it, with 13 to 19 feet at low water. When in the vicinity of Bowman bank, the light on Pomquet island should not be brought to bear to the westward of 229° until it is at least 2 miles distant.

Little river which admits boats at high water is 1.8 miles westward of Quarry head. Near its entrance is a settlement with a church.

Pomquet, or Bayfield, island, which bears $254^\circ 7\frac{3}{4}$ miles from cape Jack, and $154^\circ 14\frac{1}{4}$ miles from cape George, is 900 yards long north and south, about 300 yards broad, of red sandstone, 25 feet high, and wooded. It is joined by a reef to Pomquet point, which is 350 yards southwestward of it: and this reef dries out more than half-way from the point to the island, leaving a passage between the dry reef and the point with 3 feet in it at low water. Shallow water extends 800 yards northeastward of the island, and a reef, with a large rock at its end, dries out 300 yards from the eastern point of the island.

Light.—A square white lighthouse, 23 feet high, on the northeastern end of Pomquet island, exhibits, at 50 feet above high water,

a fixed red light that should be seen in clear weather a distance of 9 miles. The light is obscured on easterly bearings.

Pomquet road, the bay between Pomquet point and Little river, is considered safe during summer, but the riding must be very heavy in northeasterly gales. The road is sheltered by the island and its reefs, except from between north and north-northeast.

A breakwater, 700 feet long, extends off Pomquet point, but it was seriously damaged in 1902; a wharf, 442 feet in length, which has a depth of 11 feet at low water at its outer end, extends into the road at about $\frac{1}{4}$ mile southward of Pomquet point.

Anchorage.—There is anchorage in 3 to 6 fathoms, sandy bottom; but the best sheltered berth is in 4 fathoms at low water, with the southern point of the island bearing 354° , distant $\frac{1}{2}$ mile.

Directions.—Approaching this anchorage from the eastward avoid Bowman bank, if the draft makes it necessary, by keeping Pomquet Island lighthouse southward of 229° , or in not less than 7 fathoms water, until the northern point of the bank is passed.

From the northward, pass $\frac{1}{2}$ mile eastward of Pomquet island, or in not less than 8 fathoms water, until Pomquet point opens southward of the island, when haul westward into the bay.

Pomquet banks lie between 3 and 6 miles northward of Pomquet island. The banks are rocky, with irregular soundings of 6 to 10 fathoms, the least water of 6 fathoms being situated on the outer and smaller of the two banks, with Pomquet Island lighthouse bearing 177° , distant $5\frac{1}{2}$ miles. From this position the church at Little river is shut in behind the eastern side of Pomquet island.

Pomquet harbor has its narrow entrance at the eastern end of a range of low sand hills and sand beach, 1.8 miles westward of Pomquet Island lighthouse, and in the bay between it and Monk head. It is an extensive place, branching into two principal and many smaller inlets, coves, and islets; and is navigable for small craft and boats nearly 3 miles in from the sea; but it is of no use to shipping, having usually a depth of only 2 feet at low water in the narrow channel over its shifting bar of sand. The principal settlements and the church are on the western shore of the western arm. The Indians have a chapel and a reservation of land on the eastern and larger branch, into the head of which Pomquet river, a small stream, flows.

Tides.—It is high water, full and change, in Pomquet harbor at 9h. 15m.: springs rise 4 feet, neaps $2\frac{1}{2}$ feet.

Monk head is a cliff of gypsum, 45 feet high, bearing 289° , 3.9 miles from Pomquet Island lighthouse. A rocky bank, with 3 fathoms least water, extends $\frac{3}{4}$ mile eastward of it, and there is a patch of 4 $\frac{1}{2}$ fathoms at 75° , $1\frac{1}{2}$ miles from the head.

A large sheet of water westward of Monk head, locally known as Duns lake, is separated from the bay by a beach of sand, and from Antigonish harbor by marshy land, in which a channel for boats, about 700 feet in length, has been opened between Duns lake and Antigonish harbor.

Antigonish harbor, at 2.6 miles westward of Monk head, is nearly 200 yards wide at its entrance, between low points of sand, off which a dangerous bar extends eastward $\frac{1}{2}$ mile. The bar and the deep water up the harbor are marked by spar buoys on either side. The bar has a depth of 6 feet at low water, but both the depth and direction of the very narrow channel over it change occasionally.

The harbor is of great extent, running in southwestward 6 miles; the channel, between flats of mud and weeds, is 9 to 36 feet deep for about 4 miles within the entrance.

The scenery is exceedingly beautiful, the shores being broken into numerous coves, points, and islets, while a range of hills rises 760 feet behind the western shore. There are flourishing farms on either side.

Anchorage off the bar is not good, the bottom being rocky, and would be unsafe in a northeasterly gale.

Tides and tidal streams.—It is high water, full and change, in the entrance of Antigonish harbor at 9h. 0m.; springs rise 4 feet, neaps 2 feet. Northerly winds raise the level of the water and southerly winds lower it. The rate of the streams in the entrance, except that of the ebb in spring after the melting of the snow, seldom exceeds 2 knots.

Antigonish village, containing about 600 inhabitants, and two churches, stands at the head of the western arm of Antigonish harbor, distant $6\frac{1}{4}$ miles from the entrance. Gypsum abounds here, forming, with lumber and agricultural produce, the cargoes of the schooners that frequent the harbor.

There is a station of the Intercolonial railway at Antigonish.

The coast from Antigonish harbor trends northward for $10\frac{1}{2}$ miles to Ballantyne cove, the southern side of Cape George headland.

Ogden pond, $1\frac{1}{4}$ miles northward of Antigonish harbor entrance, is about 100 acres in extent, 10 feet deep, and is separated from the bay by a sand beach 130 to 250 feet in width. A channel, 30 feet wide and about $1\frac{1}{2}$ feet deep at low water, has been cut through the beach, rendering the pond accessible to small craft.

McIsaac rock, with 9 feet least water, is the middle of a small detached shoal, nearly 600 yards offshore between McIsaac point and a remarkable patch of white gypsum cliff. The rock, which is the only danger on the west side of St. George bay, is $2\frac{1}{4}$ miles northward

of Antigonish harbor entrance, and bears about 48° , 1,200 yards from the gypsum patch; it is marked occasionally by heavy breakers.

Piers.—At 4 miles northward of Antigonish harbor entrance a pier extends about 300 feet southward of Crebbing head. At about 2 miles southward of cape George a breakwater 330 feet long extends from the northern side of McNairs cove: the depth at its outer end is 12 feet at low water.

Cape George, the northwestern point of the bay, is a bold and precipitous headland, composed principally of slate, conglomerate, and trap rocks, rising, at about $1\frac{1}{2}$ miles westward of the cape, 600 feet above the sea. Shallow water extends $\frac{1}{4}$ mile off the cape, and as there is a depth of 20 fathoms at $\frac{1}{2}$ mile off it, little warning of approach is given by the lead; it should therefore be approached with caution in thick weather. There is a church, which makes a good landmark, westward of the lighthouse.

Anchorage may be obtained in westerly winds off Ballantyne cove, on the southeastern side of Cape George headland, but the ground is not good.

Light.—A square white lighthouse, 39 feet high, on the cape, 278° , 478 yards from Eachren point, its southeastern extreme, exhibits, at 350 feet above high water, a revolving white light, that attains its greatest brilliancy every 30 seconds, and should be seen in clear weather a distance of 25 miles. The light is not visible when bearing eastward of 113° .

Tides.—It is high water, full and change, at cape George, at 9h. 15m.; springs rise 4 feet, neaps 2 feet.

Tidal streams.—The flood stream from the north entrance of the gut sets nearly toward cape George, diminishing rapidly in strength as it expands in advancing northward. It is weak in the western part of George bay, sweeping round it to the northwest, with slight indrafts toward Pomquet and Antigonish. The ebb stream sets in the contrary direction.

On the eastern side of George bay the flood stream from the gut is usually met by a much weaker and contrary stream of flood, setting southwestward along the western coast of Cape Breton. These opposing flood streams generally unite somewhere off Judique shoals, and then set northwestward. The two corresponding ebb streams generally separate at about the same place; one setting toward the gut, with increasing strength, as it proceeds southward; and the other in the contrary direction, toward Port Hood. This must be understood to be of usual, and not of constant, occurrence, since the streams partake of the irregularity in the rate and duration of the tidal streams of the gut of Canso.

GEORGE BAY.

CAPE BRETON ISLAND.

Cape Breton island—West coast.—Crossing the northern entrance of the gut of Canso, from North Canso lighthouse to Cape Breton island at Heffernan point, a distance of 1.4 miles, for 7 miles northward along the western coast of the island there are no detached dangers, nor does shallow water anywhere extend $\frac{1}{2}$ mile from the shore. The land is high and rather barren looking, rising at $\frac{1}{2}$ mile inland to the summit of a ridge 850 feet above the sea, which continues parallel to the coast for 6 miles to Long point. The only remarkable object in this distance is the church at Craignish, which bears 27° , distant $2\frac{3}{4}$ miles from the lighthouse. From Long point a low cliff of red sandstone northward to Emersion point, a distance of 7.3 miles, shoals extend a considerable distance off the coast, making it dangerous to approach.

Judique shoal is of rock, and about 1,600 yards in length west-northwest and east-southeast, if only the very shallow part is reckoned; but there are patches with 2 to 3 fathoms and much rocky ground both northward and southward of it.

The least water, 4 feet, is close to the northwestern point of the shoal; and when on it the western extremity of the high land of cape Porcupine is in line with Flat and Heffernan points, which form the western end of Cape Breton island, at the entrance to the gut of Canso, and which bear 162° when in line from the shoal.

There is a narrow channel with $3\frac{1}{2}$ fathoms water between the shoal and the land, but only small craft should attempt the passage.

Buoy.—A red buoy is moored at the western end of Judique shoal.

Clearing marks.—The whole of the high land of cape Porcupine open westward of Heffernan point, 156° , leads westward of Judique shoal in 6 fathoms; or the church at Port Hood open westward of cape Susan, bearing 3° , leads westward of the shoal in 4 fathoms.

Judique bank, northwestward 2.6 miles from the northwestern end of Judique shoal, is a small rocky patch with $4\frac{1}{2}$ fathoms least water and much foul ground around it. From it cape Linzee and the south end of Smith island appear touching, and bearing 4° ; Judique church, 84° , $3\frac{1}{4}$ miles. It must be avoided by vessels of moderate draft when the sea is heavy.

Clearing marks.—Cape Linzee shut in by the eastern parts of Smith island, or the whole of the high land of cape Porcupine open westward of Heffernan point, 156° , leads westward of Judique bank. North Canso light bearing 160° , or Henry Island light, bearing 357° , will give both the bank and the shoal a good berth.

Judique village, 4.8 miles northward of Long point, contains a church. Mackay point lies north-northwestward 1.6 miles from the church, and a breakwater, 725 feet long, for the protection of fishing boats, extends from the point into a depth of 6 feet at low water. There is a telegraph office at Judique.

Ponds.—Judique pond, close northward of Judique church, is barred by a sandy ridge, so as to admit boats only at high water; shallow water extends $1\frac{1}{4}$ miles off it. Catherine pond, at 3 miles, and Susan creek, at 5 miles, northward of Judique church, are similar places; the latter admits boats at high water, and is situated just northward of cape Susan, which is rendered noticeable by the white gypsum in its cliffs.

Port Hood, the only anchorage at all sheltered on the western coast of Cape Breton island northward of the gut of Canso, was formerly a fairly secure harbor, Smith island being then a peninsula, united to the mainland by a range of sand hills which have been entirely swept away and the sand widely spread over the northern part of the harbor. The first breach in this sand bar was formed by the sea about the year 1827, during a heavy northerly gale; this breach was at first a very narrow channel, but being neglected the tidal streams have enlarged it with increasing rapidity; and the harbor, except in the small bay on the eastern side of Smith island, is now unsafe during northerly gales. The intricate northern entrance with 12 feet at low water, is used by fishing schooners drawing 12 feet, except in strong northerly winds, when the sea breaks heavily.

Port Hood village is well situated on the mainland opposite the northern part of Smith island; it may be recognized by the steeple of the Roman Catholic church, a red brick building, and the stone courthouse which are conspicuous. There is a telegraph office at Port Hood.

Supplies of fresh provisions can be obtained, but there is no good watering place.

Spithead, a sandy flat, nearly dry at low water, steep-to and usually visible, extending 1,200 yards northeastward from Portsmouth point, the southern end of Smith island, affords partial shelter from southerly winds, but a strong southerly or southwesterly gale of any duration sends in a heavy swell.

Buoys.—A black buoy is moored in 3 fathoms on the edge of the shoal water, with Portsmouth point bearing 316° , 400 yards.

A black buoy is moored at the eastern side of Spithead shoal, with Portsmouth point bearing 227° , 1,080 yards.

Clearing marks.—The southeastern end of the trees northeastward of the village in line with the Roman Catholic church, bearing

19°, leads southeastward, and the eastern end of H. Smith's house (on Smith island), in line with the western end of the chapel, bearing 337°, leads eastward of Spithead flat. (See small chart.)

Rocky shoal.—Off the mainland, but outside the entrance of the port, a rocky shoal, with 12 to 18 feet water, and steep-to, runs out 700 yards at $\frac{1}{2}$ mile northward of Ragged point.

Clearing mark.—Cape Susan and Kate point in line, 270°, leads just outside this shoal, but this mark may not be easily made out. Another and better mark is Port Hood light and the white stone base house to the northeastward, in line bearing 22°. This mark gives the shoal a wide berth. Keeping the light on the above bearing will, of course, give the shoal the same berth.

Light.—A square white lighthouse, 33 feet high, with a dwelling attached, on the cliff southward of Mill creek, at the southeastern side of the southern entrance to Port Hood, exhibits, at 55 feet above high water, a fixed light that shows white over an arc of 95° from 2° to 97°, and red over an arc of 63° from 97° to 160°, and should be seen in clear weather a distance of 10 miles.

Dean shoal, a steep sandy flat on the mainland side of the port, extends 600 yards from the sandy beach at Mill creek.

Buoy.—A red buoy is moored in 3 fathoms on the western edge of Dean shoal, with Port Hood lighthouse bearing 121°, distant 750 yards.

Clearing mark.—Cape Linzee and Isthmus point in line, bearing about 351°, leads nearly 200 yards westward of Dean shoal. This mark will also lead clear of all shoal water, including Spithead flat, as far southward as opposite Portsmouth point, but not farther.

Smith island is 2 miles long north and south, and 210 feet high; there are flourishing farms on the inner side of the island. Smith's house and barn are on the shores of the bay, on the inner side of the island, and those of the younger Smith, together with his fish shed and wharf, are farther northeastward and $\frac{1}{4}$ mile within Smith point, the eastern point of the island. With the exception of the sandy beach in the above bay, the island is everywhere surrounded by cliffs of various heights up to 123 feet. These cliffs are formed of soft reddish sandstones, shales, and marls, containing occasionally thin seams of coal, with beds of gypsum, limestone, and trap, which last show well at the northwestern end of the island.

Shoal.—A spit with 3 to 6 feet of water over it extends 900 yards southward from Smith point.

Buoys.—A red buoy marks the southern, and a similar buoy the eastern, ends of the spit.

Henry island, or Justaucorps, lies about 1 mile southwestward of Smith island. It is 1 mile long, and its greatest height is 195 feet.

It is of the same rock formation as Smith island and is nearly surrounded with cliffs which yield rapidly to the action of the waves and of the atmosphere and which on the outer side are 100 feet high. It has no permanent inhabitants, but is much frequented by fishermen during the fishing seasons.

The island is bold to seaward, but shallow water runs out from Fishery point, its southeastern extremity, $\frac{1}{3}$ mile to the depth of 3 fathoms, and $\frac{3}{4}$ mile to 5 fathoms.

The passage between Henry and Smith islands has numerous rocky shoals in it, and is so intricate that it should not be attempted except by a seaman in a very small vessel, with fine weather, and with local knowledge.

Light.—An octagonal lighthouse, 53 feet high, its sides painted red and white alternately, and the lantern red, on the summit of Henry island, at about 34° , 467 yards from Justaucorps point, exhibits, at 240 feet above high water, a group revolving white light, which should be seen in clear weather a distance of 22 miles. The light has three phases in succession with intervals of 10 seconds between their points of greatest brilliancy; these phases being followed by an interval of 40 seconds, during the greater part of which the light is eclipsed; the total period of revolution is therefore 1 minute.

The keeper's dwelling, a white building, is situated 165 feet southward of the lighthouse.

Ice.—The harbor is usually frozen over about January 20, and is completely closed until about April 20, when the ice clears; field ice comes in and disappears about the same times as the harbor ice.

The first vessel arrives about May 1, and the last leaves about January 1.

Piers.—A pier, with a depth of 12 to 15 feet at its outer end, extends off the village on the eastern side of the harbor. The Port Hood Coal Company have loading piers here.

Anchorage.—At the anchorage in the northwestern part of Port Hood, formed by the eastern side of Smith's island, there are depths of 3 to $4\frac{1}{2}$ fathoms, mud; and the heavy swell does not roll in round the northeastern point of the island, owing to the spit extending southward from Smith point.

Directions.—Pass not less than $\frac{1}{4}$ mile southward of Henry island, steering 76° until the southern end of the trees northeastward of Port Hood village is in line with the Roman Catholic church, bearing 19° , and then steer on that range, passing eastward of Portsmouth and Spithead shoals, and when the eastern end of H. Smith's house is in line with the western end of the chapel on Smith island, bearing 337° , steer that course keeping the range on until Port Hood lighthouse bears 122° , when anchor in $4\frac{1}{4}$ fathoms; or if the draft permits and

better shelter is desired, steer about 302° for the distance of 400 yards, and anchor in about $3\frac{1}{2}$ fathoms of water.

Proceeding from the gut of Canso to Port Hood, after having rounded Judique shoal, bring Port Hood light to bear 30° , and keep it so until the range of the Roman Catholic church and the trees is picked up, or until Henry Island light bears 278° , when the church and trees ought to be plainly seen and the range easily picked up, then follow directions given above.

If the weather is so thick that the ranges are not visible, the harbor should not be attempted except by those with intimate knowledge of it.

Caution.—Implicit reliance must not be placed in the buoys, as they are frequently out of position.

Tides and tidal streams.—It is high water, full and change, at Port Hood at 9h. 0m.; springs rise $4\frac{1}{2}$ feet, neaps 2 feet. The flood stream sets southward and the ebb stream northward; these streams are weak at the anchorage, and their rate anywhere in the harbor is usually less than 1 knot.

Storm signals are exhibited at Port Hood.

CAPE BRETON ISLAND.

The northwest coast of Cape Breton island from cape Linzee, at $1\frac{1}{2}$ miles northward of Port Hood, trends north-northeastward to cape St. Lawrence, a distance of 73 miles, without a harbor or safe anchorage for ships. Its general character is high and bold, the shoals being few and close inshore.

The prevailing rocks of this coast are sandstones, shales, and conglomerates, with occasional beds of gypsum and thin seams of coal, together with a more ancient slate formation in nearly vertical strata. These last form the higher hills of the coast and rise in one part nearly 1,300 feet above the sea. These rocks are precipitous, making the landing of boats on the coast impossible except at the mouth of ravines or small streams in fine weather.

The soil, especially in the valleys and lower grounds, appears to be productive and well suited to the rearing of cattle, considerable quantities of which are annually exported from Mabou and Margaree rivers.

The settlements continue along the coast as far northward as Cheticamp, after which they cease and the mountains approach close to the shore, excepting at Grandance, where there is a small settlement.

The fisheries are valuable. Salmon are taken in all the principal streams, and the Margaree is so celebrated for its salmon fishery that

it has sometimes been called the Salmon river. Herring, mackerel, cod, etc., abound in their seasons, and are frequently taken in large quantities. The seal fishery is also attempted occasionally, but is a precarious pursuit.

Caution.—This coast is a dangerous one to be near in autumn or early winter, when the prevailing northwesterly winds send in a heavy sea, and the set of the current is often in the same direction toward the land. The swell frequently precedes the wind by many hours, and as there is no good holding ground, sailing vessels must not be caught by the swell close inshore.

Currents.—Even with a smooth sea and in fine summer weather there is a set toward this coast, due sometimes to the general southeasterly current running between Magdalen islands and Prince Edward island, and at other times to the ebb, or northeast-going, tidal stream inclining toward it. These streams, being inconstant and irregular both in rate and direction, must be guarded against. In summer the rate of the current or tidal streams does not exceed 1 knot even close inshore, excepting round cape St. Lawrence and cape North, where the rate is sometimes 2 to 3 knots, causing a heavy breaking sea. The direction of the combined streams for three-fourths of the time is eastward; this appears to be due to the southeasterly current, and the ebb, or northeast-going, tidal stream predominating over the flood, or southwest-going, tidal stream, and rendering it nearly imperceptible, excepting at or near spring tides. Winds, present or at a distance, also influence these streams, as they do the streams in all parts of the gulf.

Mabou river, at 4 miles northeastward of cape Linzee, is entered by a dredged channel, 130 feet in minimum width and 12 to 15 feet in depth, except over the bar, where the least depth at low-water springs is 10 feet. On the southwestern side of the channel there is a breakwater pier, 835 feet in length, with stonework extending about 1,600 feet out from its outer end; the inner end of this stonework is 8 feet above and the outer end 5 feet below extreme low water. The bar is about 200 yards seaward from the outer end of the pier.

From its entrance to the bridge, a distance of $3\frac{1}{4}$ miles, this river resembles a mountain lake, being in one part $\frac{3}{4}$ mile wide and carrying 5 to 8 fathoms water. Boats can ascend with the tide to about 2 miles above the bridge, where the fresh water forms only a small stream. The Mabou is joined, at about $2\frac{1}{4}$ miles within its entrance, by Southwest arm and Becket river, two smaller streams.

The shores of the Mabou are well settled, principally by Scotch highlanders; there are flourishing farms on either side, and on the right bank at 3 miles within the entrance a chapel. The scenery is

very beautiful, the hills rising immediately from the northern shore to the height of 870 feet.

On the northern side of the river, at 800 and 1,400 yards, respectively, within the outer end of the breakwater pier, there are two wharves where vessels lie to load gypsum.

Owing to the narrowness of the channel and the rapidity of the tidal streams it is dangerous to enter Mabou river, except with a flood stream and a smooth sea; local knowledge is desirable.

Lights.—A mast, 20 feet high, with a white shed at its base, at the outer end of the breakwater pier on the southwestern side of the dredged channel, exhibits, at 25 feet above high water, a fixed white light, which should be seen in clear weather a distance of 9 miles.

A similar mast on the shore at McFayden's wharf, and distant 1,000 yards from the outer lightmast, exhibits, at 30 feet above high water, a fixed red light, which should be seen in clear weather a distance of 7 miles.

The lights in line lead through the dredged channel up to the breakwater.

Tides and tidal streams.—It is high water, full and change, at the entrance to Mabou river at 9 h. 0 m.; springs rise 4 feet, neaps 2 feet. Northeasterly winds often cause high tides; southwesterly winds the contrary.

The tidal streams at the river entrance frequently run at the rate of 4 knots.

Shipping.—In 1902 Mabou was entered by 32 steam vessels of 1,386 tons and by 28 sailing vessels of 1,636 tons, coastwise; the same vessels cleared.

Telegraph.—There is a telegraph office at Mabou.

Coal Mine cove is about 2 miles northeastward of Green point, the northeastern entrance point of Mabou river, and in it there is a breakwater pier 320 feet long and a wharf 160 feet long, with 18 feet water at their ends. In fine weather these wharves, from which double railway tracks have been built to the mines, can be used for shipping coal.

A wharf is being built at Finlay point, a little farther northward.

Mabou high land, which is very remarkable, commencing at cape Mabou, rises 1,000 feet above the sea and extends 11 miles northeastward along the coast, which latter is lofty and precipitous.

The coast northeastward of these high lands becomes less elevated, the beaches and landing places more frequent, and the settlements are continuous until past Cheticamp island.

Sight point, which is about $6\frac{1}{2}$ miles north-northeastward of Green point, has a small breakwater to shelter a landing place for boats.

Broad cove is $13\frac{1}{2}$ miles north-northeastward of Green point. Inverness village is on the shore of the cove, and the Inverness and Richmond railway from Port Hastings ends here.

A steamer from Pictou calls weekly, and there is a telegraph office.

Sea Wolf island, 18 miles northeastward of Green point and $2\frac{1}{4}$ miles offshore, is 1.1 miles long, northeastward and southwestward, 600 yards broad, and about 260 feet high. It is of sandstone, precipitous and bold all around, except at its northeastern end, whence shallow water extends off 200 yards. It affords some shelter to small fishing vessels and boats, which can land upon it in fine summer weather; at other times the sea rolls completely round the island, and the anchorage is never safe, the ground being everywhere rocky.

The depth between this island and the shore is 7 fathoms, over a bottom of rock, with loose sand and gravel occasionally.

The sea in the vicinity of the island abounds with fish.

Light.—A square, white lighthouse, 40 feet high, with a dwelling attached, on the summit and near the middle of Sea Wolf island, exhibits, at 298 feet above high water, a fixed white light, which should be seen in clear weather a distance of 21 miles.

Caution.—From a position in dangerous proximity to the island, the light may be obscured by the abrupt cliffs of the island.

Margaree river, $7\frac{1}{2}$ miles northeastward of Sea Wolf island, has a very narrow and intricate channel, through which the tidal streams run at the rate of 4 knots, and its entrance is obstructed by a bar of shifting sand, over which there is, at times, a depth of only 5 feet at lowest water. A breakwater has been built on the southwestern side of the entrance, and beach protection works constructed on the northeastern side. It is only under favorable circumstances of wind and weather, and with a smooth sea, that small vessels can safely enter the river. The surf on the bar is at times heavy and dangerous to boats, especially when the strong tidal stream is running out against wind and sea. Boats can ascend about 6 miles from the entrance, at which distance the tide ends.

The shores of the river are well settled, principally by Acadians and Scotch highlanders, who, besides farming, prosecute the salmon and other fisheries.

Range lights.—A square pyramidal, white lighthouse, 22 feet high, on the western side of the entrance of Margaree river and 56 yards inshore from the bank, facing the channel entrance, exhibits, at 75 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 10 miles on, and over a small arc on each side of, the range line.

A similar lighthouse, 33 feet high, at 167° , 72 yards from the preceding lighthouse, exhibits, at 105 feet above high water, a fixed red

light, which should be seen, in clear weather, a distance of 10 miles on, and over a small arc on each side of, the range line.

These lighthouses, or their lights, in line, 167° , lead into Margaree harbor at Margaree river entrance, clear of the breakwater on the southwestern side of the entrance.

Tides.—It is high water, full and change, in Margaree river at 8h. 40m.; ordinary springs rise $3\frac{1}{2}$ feet, neaps 2 feet.

Communication.—A steamer from Pictou calls at Margaree weekly.

Shipping.—In 1902, 2 seagoing sailing vessels of 66 tons, 46 coasting steam vessels of 4,163 tons, and 36 coasting sailing vessels of 1,239 tons, entered the port.

Friar head, with a fishing station near it, is $5\frac{1}{2}$ miles north-northeastward of Margaree river entrance; a breakwater is in course of construction to protect a small wharf and the boat anchorage.

Grand Etang.—Between Margaree river and Cheticamp island, which is 10 miles northeastward, there are several places where boats can land in fine weather, especially at Grand Etang (Squirrel pond), distant $7\frac{1}{2}$ miles from the Margaree.

There are farms all along this coast, which becomes high at a short distance inland; mount Squirrel, 1,220 feet high, situated in rear of Grand Etang, is the highest part.

A channel has been opened through the beach which separated the waters of the gulf from the deep Grand Etang, and protection works have been carried out to make the pond available for sheltering small vessels and fishing boats. A bridge 563 feet long, which has an opening for boats, crosses the pond.

A steamer from Pictou calls at Grand Etang weekly. There is a telegraph office.

Light.—A square, white lighthouse, 23 feet high, with sloping sides, near the outer end of the breakwater on the southern side of the channel leading into Grand Etang, exhibits, at 24 feet above high water, a fixed red light, which should be seen from all directions seawards, in clear weather, a distance of 6 miles.

Cheticamp (Chetican) island, $3\frac{1}{4}$ miles long, north-northeast and south-southwest, and about 1,600 yards wide, is an island only when high tides overflow the low and narrow beach of sand and shingle that at other times unites the southern end of the island to the mainland.

The principal fishing station on this coast is on Cheticamp point, the southwestern point of the island, where there are buildings, fish stages, and a flagstaff.

There is no landing on the seaward coast of Cheticamp island, where, for its whole length, from Cheticamp point to Enragée point,

are perpendicular or overhanging cliffs of sandstone, containing coal fossils. These cliffs are nearly as high as any part of the island, which is 200 feet in height, and they are being constantly undermined by the sea.

Light.—A square, white lighthouse with a red lantern, 36 feet high, on Cheticamp point, exhibits at 149 feet above high water a revolving white light, which attains its greatest brilliancy every 45 seconds, and should be seen from seaward in clear weather a distance of 18 miles, except where obscured by the high land of Cheticamp island. A dwelling is attached to the lighthouse.

Anchorage.—Within Cheticamp point, there is indifferent summer anchorage in $4\frac{1}{2}$ fathoms, which receives some shelter from the shoal extending $\frac{1}{2}$ mile southward from Cheticamp point, but is completely open to winds from south-southwest to west-northwest, which send in a heavy sea. The sand and gravel bottom is so loose and bad for holding that the anchorage is quite unsafe after August, and at no time is it recommended. Vessels wishing merely to communicate with the shore should anchor outside at the distance of 1 or 2 miles, where they will have room to weigh if a westerly wind sets in.

Cheticamp Eastern harbor lies between the island and the mainland, and its entrance is between the single spit at cape Gros, the northeastern end of the island, and Caveau point, on the mainland. Small fishing vessels sometimes anchor within this entrance, but outside the bar, which is $\frac{1}{2}$ mile farther in; unfortunately northerly winds send in so heavy a sea that this anchorage is even less secure than that at the southwestern end of the island. There is a depth of $3\frac{1}{2}$ fathoms within the harbor, and there was formerly only 2 feet at low water over its bar of sand, then in great part dry; but the channel over the bar has been dredged for a width of 80 feet to a depth of 13 feet at low water. There is good anchorage for large vessels inside, and numbers of fishing and other vessels run for this harbor for shelter in bad weather.

There are several wharves and a government pier in the harbor.

Entrance range lights.—A square, white lighthouse, 27 feet high, on Caveau point, exhibits at 52 feet above high water a fixed white light, which should be seen from seaward in clear weather a distance of 8 miles, where not obscured by land.

A similar lighthouse, at 105° 250 yards from the preceding light, exhibits at 97 feet above high water a fixed white light, which should be seen in clear weather a distance of 8 miles on, and over a small arc on each side of, the range line.

These lights in line, bearing 105° , lead into the entrance of Cheticamp Eastern harbor, clear of the northeastern end of Cheticamp island and between it and Caveau shoals; they should be kept in align-

ment until the range lights on the eastern side of the harbor are in line.

Channel range lights.—A square white tower, with a red lantern, 30 feet high, on the eastern side of Cheticamp Eastern harbor, exhibits at 45 feet above high water a fixed red light, which is visible on, and over a small arc on either side of, the range line, and should be seen in clear weather a distance of 8 miles.

A square, white tower, with a red lantern, 38 feet high, at 175° , 330 yards from the preceding light, exhibits at 62 feet above high water a fixed white light, which is visible on, and over a small arc on either side of, the range line, and should be seen in clear weather a distance of 13 miles.

These lighthouses in line, 175° , lead from the range of the lighthouses on Caveau point, through the dredged channel, which is marked by spar buoys on both sides, to the anchorage in Eastern harbor.

Tides.—It is high water, full and change, in Cheticamp Eastern harbor at 8h. 15m.; springs rise $3\frac{1}{2}$ feet, neaps 2 feet. Northeasterly winds cause higher tides and southwesterly winds cause lower tides.

Settlement.—There is a settlement of Acadians on the mainland side of the harbor and there are some houses on the island side.

A steamer from Pictou calls here weekly, and there is a telegraph office.

Storm signals are exhibited at Cheticamp.

Supplies.—Fresh provisions in a limited quantity can be obtained at the settlement. Water can be taken from the streams on the eastern side of the harbor, but on the island it is scarce and not good.

Caveau shoals, which lie in the approach to Cheticamp Eastern harbor, at $\frac{1}{2}$ mile off Caveau point, and extend from 600 yards to $\frac{3}{4}$ mile north-northeastward of cape Gros, are two rocky patches, with 9 feet least water.

Jerome ledge, with only 5 feet water, is about 1,400 yards long, north and south, 600 yards wide, and its northern point lies north-northeastward 2 miles from cape Gros, 1 mile from the shore.

There is a depth of 10 fathoms water 600 yards outside this ledge and Caveau shoals; therefore little warning is given by the lead, but the points on the western side of Cheticamp island, namely, Enragée point and The Capes, in line, bearing 210° , leads northwestward of them.

Presqu'île, where the mountains approach closely to the shore, is $2\frac{3}{4}$ miles northeastward of Caveau point.

The coast, between Presqu'île and Grandance, $11\frac{1}{4}$ miles north-eastward, is bold and mountainous, affording no good landing place, nor does it contain any inhabitants.

Grandance.—At Grandance there is a small settlement, near which is a river or stream silted up by a shingle beach, on which boats land, and are hauled up if necessary. It seems to be known locally as Pleasant bay, where a steamer from Pictou calls weekly.

The coast from Grandance to cape St. Lawrence, a distance of 13 miles, is high and precipitous, the land back of it rising from 700 to 1,100 feet; landing for boats is possible only with a smooth sea and at one or two places, and even there it is indifferent.

Cape St. Lawrence, the northwestern point of Cape Breton island, is of slate rock; it affords landing only on its western side, where there is a brook, and a steep stony beach, on which a boat can be hauled up with difficulty.

Bear hill, a remarkable sugarloaf, 750 feet high, is about 1,600 yards southeastward of cape St. Lawrence, and close to the coast.

Black rock, always above water, is about 1,600 yards farther eastward, and 335 yards offshore.

Lights.—A square white lighthouse, with a red lantern, 56 feet high, and with a dwelling attached, on the northern extreme of cape St. Lawrence, exhibits two fixed white lights, at 137 feet and 95 feet above high water, which should be seen in clear weather distances of 17 and 15 miles, respectively.

The upper light is visible seaward from 59° to 251° , and the lower light from 62° to 248° .

Meat cove—Black point.—The northwestern point of Meat cove lies 600 yards east-southeastward of Black rock, and Black point, the southeastern point of the cove, is about $\frac{3}{4}$ mile farther east-southeastward. There is a settlement, and good landing for boats in the cove.

Shag rock lies rather more than 200 yards northwestward of the inner part of Black point.

Telegraph and signal station.—There is a telegraph and signal station at Meat cove. It is included in Lloyd's system.

Information as to weather, wind, movement and condition of the ice in the gulf and river St. Lawrence may be obtained after the beginning of April by communicating with the signal station.

St. Lawrence bay, lying between Black point and cape North, which bears 84° , distant 4.7 miles from Black point, is $1\frac{3}{4}$ miles deep, with bold shores, and depths of water under 20 fathoms which are not too great for anchoring, but the bottom, being of either rock or loose sand, is not to be trusted for holding. In summer, when strong northerly winds are of rare occurrence, the bay affords, near its head, at $\frac{1}{2}$ mile offshore, temporary open anchorage, in 9 to 10 fathoms

water; but vessels must weigh immediately on the approach of a wind from seaward.

There are settlements and good landing at Wreck cove, in the southwestern part of the bay, and at Deadman pond, in the southeastern part, the principal fishing establishment being at Deadman pond.

Cape North, the northeastern extreme of Cape Breton island, is a bold, steep headland of slate rock in nearly vertical strata, rising abruptly 1,000 feet above the sea. The cape is steep-to, but with some rocks above water close off it; and these rocks extend over 200 yards off Money point, at 1 mile southeastward of the cape.

The passage between the cape and St. Paul island is 13 miles wide, with very deep water and clear of dangers. Violent squalls are frequent off the headland.

Position.—Cape North is in latitude $47^{\circ} 02' 35''$ N., longitude $60^{\circ} 24' 56''$ W.

Light.—A square, white lighthouse, rising from a dwelling, and with an octagonal red lantern, 26 feet high, at about 1,400 yards southward of Money point, exhibits, at 74 feet above high water, a revolving light, showing red and white alternately, and attaining its greatest brilliancy every 45 seconds. The light should be seen a distance of 14 miles in clear weather.

Tides.—It is high water, full and change, at cape North at 8h. 0m.: springs rise 4 feet, neaps 3 feet.

Currents.—Notwithstanding the bold nature of the northern and eastern coasts of Cape Breton island wrecks have occurred upon it in the dense fogs which accompany easterly winds. The wrecked vessels have generally been steering a supposed safe course to pass northward of St. Paul island into the gulf of St. Lawrence; but the current which so frequently runs southeastward out of the gulf was not allowed for.

After long continued easterly or northeasterly winds, which raise the level of the water in Bras d'Or lake and neighboring harbors, it is not unusual to find a current, with a rate of 1 knot, running for several successive days, along the land from off St. Anne to near cape North, where it meets the current out of the gulf and is turned to the eastward, causing a great rippling. The fishermen affirm that it as often runs in the opposite direction, and also, that at times there is a regular alternation of the flood and ebb tidal streams.

Caution.—Owing to the inconstant nature of these currents, great caution is required when approaching this coast in fogs.

CHAPTER IV.

NORTHUMBERLAND STRAIT, SOUTH AND WEST SHORES— NOVA SCOTIA AND NEW BRUNSWICK—CAPE GEORGE TO ESCUMINAC POINT AND MIRAMICHI BAY.

VARIATION IN 1908.

Cape George 23° 45' W.
Cape Tormentine 22° 48' W.

Shediac point 22° 30' W.
Escuminac point 23° 25' W.

NORTHUMBERLAND STRAIT.

Caution.—There are few places in which more care is required for navigation than in Northumberland strait, which is 160 miles in length, and which, at cape Tormentine, the narrowest part, is but 7 miles from shore to shore, while the navigable breadth between the shoals is $5\frac{1}{2}$ miles. The descriptions of the dangers will therefore be full and specific.

Fogs.—Dense fogs, which are so frequent in other parts of the gulf, are seldom found in Northumberland strait. The prevailing southwesterly wind of summer, which in the bay of Fundy is generally accompanied by thick fog, parts with its moisture in passing over the heated land of Nova Scotia, and becomes a hot, dry wind off the northern coast of that province. It gets tempered in its passage over the strait, gets heated and dried again in some degree in passing over Prince Edward island, but acquires once more its moist and foggy character long before it reaches the northern shore of the gulf and not infrequently before it arrives at Magdalen islands.

Tides and tidal streams.—The times of high water and the tidal rise in the various harbors in Northumberland strait, together with the rate of the tidal streams in their entrances, are given in this and the following chapters. The rise given for the harbors in the strait and also on the northern coast of Prince Edward island is always that of the best tide of the 24 hours, and the a. m. spring tides are the highest during summer. At or near springs it frequently occurs that the p. m. tides rise only a few inches, and sometimes they entirely disappear, causing single day tides for a short time; as at Richibucto and Shediac.

The a. m. spring tides are also the earlier during summer, as for instance, at Cascumpeque in July, at full and change, the a. m. high water occurred at 4h. 22m., and the p. m. tide at 6h. 58m.; the mean of 5h. 40m. is given as the time of high water, full and change, and similarly in other cases. At or near neaps the two tides of the same day become nearly equal in time and range for a day or two. These remarks are of importance to vessels taking the dangerous bars in heavy weather.

As the tides of the strait are peculiar, a general description of the course of the tide waves and of the rates and directions of the streams which they occasion will not be out of place.

The tide wave entering the gulf through Cabot strait and causing high water between Cape Breton and Magdalen islands, and partly passing southward of Anticosti while progressing to the entrance of the estuary of the river St. Lawrence, sends off, laterally, waves to the southwest. The first of these, the eastern wave, passing between the western coast of Cape Breton island and Magdalen islands, arrives at the eastern entrance of Northumberland strait at about 8h. 15m., and proceeds westward, making high water later in succession from east to west as far as Pictou, which it reaches at 10 hours. At the same nominal hour, but 12 hours later, the other or western wave, which has passed northward and westward of Magdalen islands and entered Northumberland strait by its western entrance, arrives in the region westward of cape Tormentine, having been retarded by the long detour which it has taken and by the great extent of comparatively shallow water which it has passed over in its subsequent progress to the southwest. This wave makes high water later in succession at places along the eastern coast of New Brunswick, after entering the strait, and proceeding southward; this naturally is contrary to the course of the other or eastern wave.

Thus it is high water, full and change, at Miscou at about 2½ hours; at Escuminac point and North point of Prince Edward island, forming the western entrance of the strait, at about 4 hours; at West point of Prince Edward island at 6½ hours; at Shediac at noon.

The eastern wave, going northwestward, and the western part of the preceding tide wave, going southeastward, meet in the region westward of cape Tormentine, the vicinity of Shediac being considered the meeting place by local seamen, and combine to make high water at the same hour, namely, about 10 hours, or a little later, in the harbors all over the central portion of the strait from Pictou to Shediac point. They cause also a tidal rise everywhere between Pictou and bay Verte more than double, and in some of the harbors nearly three times, that which occurs at either entrance of the strait.

The direction of the tidal streams corresponds generally, and in fine weather, with the progress of the tide wave, but is disturbed occa-

sionally by strong winds. The eastern flood or west-going stream enters the strait from the northeastward and runs at the rate of $2\frac{1}{2}$ knots past East point of Prince Edward island. It runs round cape Bear, and turns with an increasing rate northwestward through the strait; it is strongest in the deep water near the land, and runs at its greatest rate of 3 knots close past Indian rocks and Rifleman reef. Decreasing in rate as it proceeds farther northwestward, it is a very weak stream when it meets the other flood stream off Tryon shoals.

This eastern flood or west-going stream is not so strong along the southern shore of the strait, except in Caribou channel for a short space near Caribou reef; and it is weak, generally not exceeding $\frac{1}{2}$ knot, in the middle of the strait.

The western or southeast-going flood stream, coming from the northward, runs along the west coast of Prince Edward island, sweeping round West point, and is strongest in the deep water near West reef, where its rate is $2\frac{1}{2}$ knots. Toward the New Brunswick coast its rate seldom exceeds $1\frac{1}{2}$ knots, which is its average rate as it progresses southeastward, until near cape Tormentine, where the strongest part of the stream runs near Jourimain shoals, and thence southward round and over Tormentine reefs, with a great ripple, at the rate of 3 knots.

After passing these reefs a part of this stream curves round to the southwestward with a decreasing rate, and unites with the other flood or northwest-going stream in bay Verte, whilst the rest is lost in the central part of the strait.

Both the eastern and western ebb streams pursue courses generally contrary to the flood, and at nearly the same rates.

The interval between the turn of the streams and high water or low water on the shore varies with the moon's declination; the streams turning, on an average, at high and low water when the moon is on the equator; but the turn may take place as much as 2 hours before high water or after low water.

Thus it will be seen that a fast vessel, under favorable circumstances, might enter the strait with the flood, and arrive off Tryon shoals soon after high water; there take the ebb, and thus have the stream with her, with but slight interruption, from one end of the strait to the other.

Strong winds in the gulf greatly influence the rate and direction of the streams in the strait, as well as the tidal range; moreover, as the two tide waves which meet in the western part of the strait are 12 hours different in age, so they are, consequently, owing to the diurnal inequality, of unequal heights, each of them being alternately and in turn the highest; and when the moon is near its greatest declination, either north or south, there is probably a strong set in each direction during the rise and fall of one tide, and a weaker set

during the other tide of the same day, and this is also marked at the solstices. But when the moon is on the equator the tidal streams become equal.

General directions.—When bound to ports in the eastern portion of Northumberland strait, enter the gulf either by the gut of Canso, or by Cabot strait. In the first case, from the northern entrance of the gut steer to pass a moderate distance off cape George, whence there is no difficulty in running along the land to the westward, if attention be paid to the soundings and the bearings of the light-houses or lights. The lights on Pictou island should be picked up long before Cape George light is lost. In thick weather, and if the light on the southeastern point of Pictou island is obscured at night, beware of the reef off the eastern end of Pictou island, which should not then be closed to a depth of less than 10 fathoms, especially if the flood or westgoing stream be running.

Having entered the gulf by Cabot strait, when approaching the eastern entrance of Northumberland strait between Cape Breton and Prince Edward islands, do not close East point of Prince Edward island to a depth less than 20 fathoms in thick weather. In clear weather the lighthouses on Sea Wolf and Cheticamp islands, East point, and cape George will give means of plotting the position.

Under the same circumstances of entrance and weather, cape Bear and its reef should not be closed to a depth less than 15 fathoms, or Fishermans bank to less than 13 fathoms, and caution is necessary when in the vicinity of this bank. From cape Bear, if bound westward of Pictou, keep over toward Pictou island and the southern shore, guided by the soundings till Indian rocks and Rifleman reef are passed, after which the lead affords sufficient guidance along the coast of Prince Edward island past Tryon shoals and northward through the strait. In clear weather the lighthouses on Wood island and Prim point will afford means by bearings of passing Indian rocks and Fishermans reef.

On the coast of Nova Scotia, westward of Pictou, the principal dangers to be avoided are Middle shoals, between Pictou island and Caribou, Amet island and shoals, and Waugh shoal. In thick weather the approaches to all these are sufficiently indicated by the soundings, and therefore constant use of the lead and reference to the chart will enable the intelligent seaman to take his vessel through the strait without difficulty. Pilots may be obtained to enter the harbors.

When bound to Miramichi and the ports in Northumberland strait westward of cape Tormentine, after entering the gulf by Cabot strait, it is usual to pass southward of Magdalen islands and round North point of Prince Edward island. When approaching the reef off North point at night or in thick weather keep the lead constantly

going, and bear in mind the probability of having been set southward in crossing from Magdalen islands, especially with northerly winds.

In thick weather also, and bound into the strait, after rounding North point, steer well to the westward, so as to insure clearing West reef, which pass by the lead, running along the bank off the coast of New Brunswick. Having passed West reef, use the lead, which affords sufficient guidance along either shore until near the narrow part of the strait at cape Tormentine.

Then to proceed farther southeastward, keep on the coast of Prince Edward island, the lights and soundings on that side being sufficient to guide past Carleton head, cape Traverse, and Tryon shoals, where caution is necessary on account of irregularity of the tidal streams and the frequent set of the ebb toward the shoals. The tidal streams, however, in this narrow part of the strait, are not very strong along the coast of Prince Edward island, off which there is good anchorage (for a sailing vessel in the event of the wind failing), whilst on the opposite side there is deep water, and very strong tidal streams close to Jourimain and Tormentine reefs.

If the wind be adverse, or scant from the southward, with the ebb or northwest-going stream running, this narrow passage should not be attempted in a sailing vessel when the land or lights can not be seen. Under such circumstances it is usually advisable to anchor westward of the passage till a change of weather or stream renders it safe to proceed.

NOVA SCOTIA.

The coast of the mainland from the northern point of Cape George headland trends approximately southwestward 27 miles to Merigomish harbor, and is bold and clear of dangers. The land, rising to the summit of a ridge 2 to 3 miles in rear of and parallel to the coast, is well settled and cultivated, the cultivation extending occasionally to the top of the ridge, which attains, in High hill, the height of 1,010 feet above the sea.

There is no harbor on this coast; but for the purpose of affording shelter to fishing boats and a landing place for steamers and small vessels, a breakwater has been constructed at Livingston cove, about 2 miles southwestward of cape George; it is 312 feet long and extends out into 9 feet at low water springs. There is also a wharf, 251 feet long, with a depth of 7 feet at its outer end, at Georgeville, situated about 6 miles southwestward of cape George.

Malignant bay, which has a small stream at its head, affording good landing for boats, is about 9 miles southwestward of the northern point of cape George, and will be known by the Sugarloaf hill, which reaches the height of 680 feet, 1 mile in rear of the bay. At the head of the bay a channel for boats, 30 feet wide and 2 feet deep

at low water, has been cut through the gravel beach into a small pond, and protection works constructed.

Frenchmans barn, a remarkable rock, lies nearly 2 miles southwestward of Dunn point, the southwestern point of Malignant bay, and $\frac{1}{2}$ mile northeastward of Arisaig church.

Arisaig point extends a short distance westward from the mainland about $\frac{3}{4}$ mile westward of Frenchmans barn. A pier, which has a depth of 10 feet at low water springs at its outer end, runs off the point, and affords shelter to boats and shallops in easterly winds, but none in winds between north and west; it has, however, recently been lengthened.

Arisaig village is situated in rear of the point.

Light.—A square white lighthouse, 30 feet high, about 40 yards in rear of Arisaig point, exhibits at 40 feet above high water a fixed red light that should be seen in clear weather a distance of 7 miles.

Rock.—A pinnacle rock, with 7 feet water over it and 25 to 30 feet around, lies 259° 400 yards from Arisaig lighthouse.

Bailey brook, a large stream, flows into Northumberland strait 5 miles southwestward of Arisaig point; during freshets it brings down a large quantity of water to the sea: but in summer it becomes nearly dry, and its mouth is obstructed by sand cast up by easterly winds. Works have been built for the improvement of the entrance, in order to permit boats to enter for shelter.

Merigomish island, the eastern end of which lies 8 miles southwestward of Arisaig point, is $3\frac{1}{4}$ miles long northeast and southwest, $1\frac{1}{3}$ miles broad, and 150 feet high; it is of clay and sandstone, belonging to the coal formation. Thin seams of coal are visible at Coal point, the northern point of the island, where the cliffs are 35 feet high. The southern coast, where there are settlements, is broken into coves, cliffy islets, and peninsulated points. A sand bar, $2\frac{1}{2}$ miles long, unites the northeastern end of the island to the mainland, excepting at unusually high tides, when the sea washes over one part of the sand bar into Merigomish harbor.

Merigomish harbor, the outer entrance of which is $\frac{3}{4}$ mile wide between King head and Merigomish point, the latter being the southwestern end of Merigomish island, has 14 feet at low water over its bar, and sufficient depth within for vessels of heavy draft; but it is so intricate and difficult of entrance that it should not be attempted by anyone not having local knowledge. And northerly winds send so heavy a sea over the bar that a vessel taking the ground then would probably be a total loss. The bar is formed by rocky shoals running out $\frac{3}{4}$ mile northward of the entrance points. The channel over the bar, and leading in from the bar, between the shoals, is 250 yards

wide; but the shoals are so steep that the lead affords little guidance, and there are no leading marks. The entrance at first trends southward, and then turns sharply eastward into the harbor close past Savage point, which is the sandy spit at the southwestern end of Merigomish island. This inner entrance of the harbor, between Savage point and Betty point, the eastern end of Olding island, is about $\frac{1}{4}$ mile wide, but the navigable breadth is reduced to 100 yards by the shoal off Olding island, where the tidal streams frequently run at the rate of 5 knots an hour, while within the harbor their rates are generally less than $1\frac{1}{2}$ knots.

Before the timber was exhausted this harbor was frequented by shipping, which usually lay moored close to the sandy southeastern point of Olding island; but it is now seldom visited except by a very few coasting vessels. The harbor runs 5 miles to the eastward within Merigomish island and the sand bar which joins it to the mainland, and also 4 miles to the westward, up a bay full of islands, coves, and precipitous headlands, which, together with well-cultivated fields, backed by hills about 800 feet high, form scenery of unusual beauty.

Several small streams enter the harbor, of which French river is the principal. This river, which flows into the harbor southward of the eastern end of Olding island, is approached by a very narrow channel, through flats of mud and weeds, and can be ascended by boats to the bridge about 1 mile above its entrance.

Tides.—It is high water, full and change, at Betty point, Merigomish harbor, at 10 h. 6 m.; springs rise $5\frac{1}{4}$ feet, neaps $3\frac{1}{4}$ feet. There is considerable diurnal inequality, which causes a large difference in the times and heights of the two tides on the same day.

Pier.—In a cove eastward of Hardwood point, and about 1 mile distant from Merigomish station on the Intercolonial railway, there is a pier, 254 feet long, with a depth of water at its outer end of 1 foot at low water springs and of $6\frac{1}{2}$ feet at high water.

Merigomish village is $9\frac{3}{4}$ miles by rail from New Glasgow. The population in 1901 was 693. Small vessels are built.

Roy island is united near Colquhoun point, its eastern end, to the mainland by a long and narrow sand bar, stretching southeastward across the eastern end of Little harbor to within $\frac{3}{4}$ mile of King head, which is the western entrance point of Merigomish harbor.

A reef of sandstone, in great part dry at low water, runs out $\frac{1}{2}$ mile eastward of Colquhoun point.

Roy ledge, a small rocky shoal, with 9 feet least water, lies 700 yards northward of Roy island and $\frac{3}{4}$ mile westward of Colquhoun point.

When approaching this part of the coast vessels should not stand into less than 6 fathoms.

Little harbor.—In the shoal bay between Colquhoun and Evans points, which are 1.6 and 3.2 miles, respectively, northwestward of King head, are two narrow and intricate channels, leading through shoals into Little harbor. The eastern and best of these channels turns sharply eastward inside of Roy island and close round the sandy spit at its southwestern end. The other has only about 1 foot water and leads into the western part of the harbor, which is of considerable extent and broken into bays, coves, and picturesque points; but is suitable only for boats, being nearly all dry at low water, excepting the narrow channels. There were 618 inhabitants at Little harbor in 1901.

Roaring Bull point, $1\frac{1}{4}$ miles northwestward of Evans point, and 4 miles eastward of Pictou Bar lighthouse, is the cliffy northern end (with a remarkable red patch on it) of a small peninsula, united to the mainland at its western end by a sandy beach; and having at the eastern end the gully or entrance to Chance harbor, dry, or nearly so, at low water.

A reef of sandstone runs out to the depth of 3 fathoms 600 yards northeastward from Roaring Bull point.

Mackenzie head, 2 miles westward of Roaring Bull point, is a sharp pointed cliff of clay and sandstone, 40 feet high, with a small white house on its edge.

Mackenzie shoal, the outer edge of which lies 1,700 yards northeastward of Mackenzie head, is a rocky bank, 600 yards across, with 16 feet least water over it, and with 19 feet between it and the shallow water to the westward. Vessels should not pass to the southward and westward of the shoal.

Clearing marks.—Caribou and Doctor points in line, about 322° , leads 200 yards eastward of the shoal; and the custom-house tower at Pictou in line with the northern end of the Bar lighthouse embankment, 248° , or Bar and custom-house lights in line, bearing 249° , leads northward of it. These marks are useful only to vessels entering Pictou harbor, as vessels passing through the strait would not be so near the harbor.

Pictou harbor is the finest on the southern shore of the gulf eastward of Gaspé, and it is important from the coal mines, quarries of building stone, and the settled country in its vicinity. The entrance of the harbor is situated at the head of a bay, which is $1\frac{3}{4}$ miles wide at its mouth between Mackenzie head and Logan point, and runs in $1\frac{1}{2}$ miles.

Shallow water extends nearly 1,200 yards northward of Mackenzie head, and its 3 fathoms edge trends thence westward toward Bar lighthouse, the whole bay on that side being shoal, with ridges

of sand drying out to a considerable distance from the shore at low water.

Buoy.—A black buoy, marked 1, is moored in 14 feet at low water near the northern end of the bank eastward of Bar lighthouse, and with the lighthouse bearing 236° . distant $\frac{1}{4}$ mile.

Boat harbor.—In the bay between Mackenzie head and Bar lighthouse and on the western side of Powell point is Boat harbor, the entrance of an extensive inlet or lake, full of mud and weeds. and which boats can traverse only when the tide is in.

Logan point.—On the northern side of the bay, reefs extend off Logan point eastward and southeastward 900 yards to the depth of 3 fathoms.

Buoy.—A red buoy, marked Macdonald reef, lies in 23 feet water at the outer end of the shoal off Logan point, with the point bearing 285° , distant 930 yards.

Clearing mark.—Bar lighthouse just open of Cole point, bearing 226° , leads over the southeastern extreme of the reefs in 14 feet at low water, but vessels should not go nearer than the depth of 4 fathoms.

Cole point, which is a cliff of clay and sandstone 30 feet high, lies 1,800 yards south-southwestward of Logan point; a reef stretches out southeastward 730 yards from it, and shallow water, known as Murdoch shoal, continues southwestward to the commencement of Loudon beach, on the northern side of the entrance of the harbor.

Buoys.—A red buoy, marked 1, lies in 13 feet water, 86° from Cole point and 500 yards from the high-water mark.

A red spar buoy is moored in 12 feet water on the northern side of the harbor entrance, at 226° , 1,300 yards from Cole point and 45° 700 yards from Bar light. During the strength of the ebb this buoy almost disappears.

Pictou road, between Mackenzie head and Logan point and outside Pictou bar, although open to northeasterly winds, affords good anchorage in 5 fathoms, clay and mud.

Directions for Pictou road.—The soundings are sufficient guides to vessels when running or beating up to this road at night and keeping the southern shore aboard with the prevailing southwesterly winds; on the opposite side, or with northerly winds, Bar lighthouse just open of Cole point, bearing 226° , leads about 1,200 yards southeastward of the reef off the eastern end of Pictou island, and also clears the southern end of Pictou bank in $5\frac{1}{2}$ fathoms; therefore vessels must keep the light open of the point, bearing 227° , until in the low water depth of 5 fathoms on the edge of the bank off Logan point. When beating, tack in the board to the northward

when the light reaches the bearing 227° . Be sure that the light does not disappear behind Cole point. Run on the 5-fathom curve about $1\frac{1}{2}$ miles to the southward and anchor with Bar lighthouse bearing 244° , distant about 2 miles.

Caution.—It must be remembered that the reef off Logan point and Cole point extends out nearly $\frac{1}{2}$ mile to 3 fathoms. Therefore in following the above directions one must not take the vessel into less than 5 fathoms.

The bearing 227° , given above, just clears the shoal off Logan point, and, of course, crosses it off Cole point. It is therefore important to remember that a vessel must not be taken into less than 5 fathoms on this bearing. It must be remembered also when anchoring that Bar light must not be brought to bear to the northward of 229° , otherwise the vessel will swing too close to Mackenzie shoal.

Pictou bar.—The distance across the harbor's mouth from the end of the sandy spit, on the south, where the light is, to Loudon beach, on the north, is about 450 yards; but the channel over the bar, about 800 yards eastward of the end of the spit, is much narrower and has a turn in it. With a good tide it is possible to carry 25 feet over the bar, and generally to reckon on 23 feet; but it must be remembered that, owing to diurnal inequality, one of the two daily tides is better than the other. The least water on the bar is 19 feet at low water, and inside the bar the depth increases to 5 and 7 fathoms.

The harbor.—The beach forming the southern side of the harbor entrance extends from $\frac{1}{2}$ mile westward of Powell point, about 1 mile in a northwesterly direction, inclosing Moodie cove, an inlet nearly dry at low water, except in a central channel. The outer end of the beach, on which is Bar lighthouse, is protected by a breastwork of timber. Thence the harbor extends west-southwestward $2\frac{1}{2}$ miles, with a width of 200 to 400 yards between the 3-fathom curves on each side.

Opposite the town, which is on the northern side of the harbor 2 miles within its entrance, the harbor expands into three large arms which are the mouths of East, Middle, and West rivers.

The channels of the last two are seldom used, except by very small craft, unless it be to bring down newly built vessels, when they are staked for the purpose. They may be navigated without much difficulty for 2 to 3 miles above their confluence; but higher up they are divided into several narrow channels, often obstructed by oyster beds, and winding through extensive flats of mud and weeds, which at low water render landing difficult.

East river is navigable by vessels of moderate draft for $2\frac{1}{2}$ miles, from Pictou to the coal loading place, or railway terminus from the Albion mines. Its channel, which joins the harbor directly opposite

Pictou, is of the average breadth of 180 yards, and marked out by spruce bush stakes driven into the mud flats at intervals on either side. Half a mile below the loading place a bar of hard ground, with 12 feet at low water, crosses the channel, and therefore vessels must not be loaded to draw more than 15 feet at neaps and 18 feet at springs. At a short distance above the loading place the channel is so divided and obstructed by old oyster beds that it is difficult to carry the depth of 3 feet through at low water, and it is rendered almost useless by similar obstructions at several places up to the bridge at New Glasgow, $6\frac{1}{2}$ miles from Pictou.

Middle river runs in south-southwestward $5\frac{1}{2}$ miles from Pictou, at which distance the tide ends, and the river farther up is rapid and fordable at low water.

The shores of West river are well settled all the way to the limit of the tide, 5 miles above Pictou, and the post-road to Truro and Halifax passes along the northern shore, where the scenery and views possess much beauty. Several hills to the westward of this river are of considerable height; Roger hill, 264° , 5 miles from Pictou, is 546 feet, and Dalhousie hill, 3 miles farther southwestward, is 950 feet above the sea. West river, although shallow and rapid above the tide water, is a considerable stream which winds its way through a beautiful and well-cultivated valley containing a large population. A railway bridge crosses the river 1 mile above Pictou.

Lights—Bar.—An octagonal lighthouse, 48 feet high, painted in red and white vertical stripes, with a red lantern, at the end of the spit forming the southern side of Pictou harbor entrance, exhibits, at 50 feet above high water, a fixed white light, which should be seen in clear weather a distance of 12 miles.

From the same tower, at 23 feet above high water, is shown a small fixed red light, which may be seen in clear weather over the shoals off the eastern coast of Pictou island, a distance of 6 miles. This light, bearing 277° , clears the east reefs off Pictou island.

Custom-house.—The highest window in the eastern side of the tower of Pictou custom-house exhibits, at 60 feet above high water, a fixed red light, which should be seen in clear weather a distance of 8 miles.

The masts of vessels in Pictou harbor occasionally obscure this light from seaward.

Bar and this Custom-house light in line, bearing 250° , lead through the channel seaward of the bar up to the range of Fraser Farm lights.

A window in the southern side of the custom-house tower exhibits, at 60 feet above high water, a fixed white light.

Fraser Farm—Range lights.—A square, white lighthouse, 30 feet high, on the north side of Pictou harbor entrance and 200 yards

inshore, with Bar lighthouse bearing 120° , distant 150 yards, exhibits, at 66 feet above high water, a fixed red light.

A similar lighthouse, 38 feet high, 278° , 128 yards from the preceding lighthouse, exhibits, at 78 feet above high water, a fixed red light.

These lights are visible in clear weather through a small arc on each side of their alignment, a distance of 8 miles. Fraser Farm lights in line leads from the Bar and Custom-house lights range, between the sand pit off Pictou bar on the south and Murdoch shoal on the north.

Ice.—The harbor is usually frozen over about December 26, and clear of ice about April 18, being completely closed between about January 9 and April 3. The first vessel arrives about April 20 and the last leaves about December 21. A small quantity of field ice occasionally drifts in after the harbor has opened.

Pilots.—The pilots of Pictou are generally able and experienced, and are always on the lookout for vessels.

Pilotage is compulsory.

Directions.—The deep water channel over the bar being only 400 feet in width, and the tidal streams having a rate that reaches $2\frac{1}{2}$ knots, a pilot is necessary in a vessel of much draft, and those in charge of even small vessels require local knowledge to beat in or out with safety.

Being farther out than Mackenzie shoal, bring and keep the custom-house tower (a red brick building) and Bar lighthouse, or their lights at night, in line, bearing 250° until Fraser Farm lighthouses or lights are in line, bearing 278° , when steer for them until Pictou Bar lighthouse or light is nearly abeam, whence a 238° course leads to the anchorage off Pictou town.

From Bar lighthouse to the usual anchorage, in 6 to 7 fathoms, mud bottom, off the eastern wharves at Pictou, the channel of the harbor is direct, 250 to 450 yards wide, 27 to 47 feet deep, and clear. There is anchorage as convenient as the usual one anywhere in the channel within Bar lighthouse, and the chart shows all necessary detail for reaching it.

Tides.—It is high water, full and change, at Pictou harbor entrance, at 10h. 0m.; springs rise 6 feet, neaps 4 feet. The tide is characterized by a marked diurnal inequality, occasionally of as much as 2 hours in time and 2 feet in height. In August, when observations were made, the a. m. tides were the highest, following the inferior transit of the moon with north declination in the first part of the lunation, and the superior transit with south declination in the latter part.

It is high water, full and change, at New Glasgow bridge at 12h. 0m.; springs rise 6 feet, neaps $3\frac{1}{2}$ feet.

Tide Tables for Pictou are published by the department of marine and fisheries of the Dominion of Canada, and by the U. S. Coast and Geodetic Survey.

Pictou town stands on the northern shore of the harbor, 2 miles within Bar lighthouse, along the shore of a small bay, and on the declivity of a ridge, which rises to the height of 200 feet at a short distance in rear of the town. A spur from this ridge forms Battery point, which shelters the place from easterly winds.

The town is well built, having, besides a station of the Intercolonial railway, many good stores, several hotels, branch banks, factories, iron foundry and machine shop, lumber yards, marble works, stone quarries, and other industries. It also contains an academy, library, Masonic hall, several churches, etc. The water front has been improved by the erection of wharves. The custom-house, a red brick building faced with stone, and having a square tower at its southern part, is on Town point. The Roman Catholic church, a red brick edifice with a spire, situated near the top of a hill to the eastward of the town, is the most noticeable of the public buildings.

The United States is represented by a consular agent.

The population in 1901 was 3,235.

The country in the vicinity of Pictou is well settled and fertile.

New Glasgow town is on the eastern side of East river and owes its existence to the coal mines, which are about 2 miles higher up, and to which boats can ascend with the tide. Vessels of considerable size are built at the town, and taken down the river when light. There are several factories, tanneries, etc.

The population in 1901 was 4,447.

Wharves.—A little more than $\frac{1}{2}$ mile westward of Bar lighthouse and on the same side of the harbor are two coaling wharves, alongside which large steamers are loaded with great dispatch, both wharves being connected with a branch of the Intercolonial railway. The Intercolonial Mining Company's coal-loading pier is near Abercrombie point.

Ferry.—From the railroad wharf at the place known as "Pictou landing" a steam ferryboat plies at alternate hours to and from Pictou.

Storm signals are exhibited at Pictou.

Repairs.—Two marine railways, 232 and 178 feet in length on the blocks, have lifting powers of 1,200 tons and 800 tons, respectively. Large repairs to hull or machinery can be executed. Divers may be hired.

Heavy castings are made by the Nova Scotia Steel and Forge Company, Limited.

Supplies.—Meat, bread, and vegetables are purchasable. Water may be obtained from a steam water boat. The best watering places are on the southern shore of the harbor. $\frac{3}{4}$ mile within its mouth, and opposite the coal loading place in East river.

Coal.—There is an unlimited supply of native coal at Pictou. Vessels coal from lighters or at the end of the wharves. There are depths of 33 and 24 feet at the outer ends of the wharves, which are 700, 1,000, and 2,000 feet in length. Vessels go alongside the eastern wharves head upstream, and secure to spar buoys one on each bow, and another on the starboard quarter.

Labor is plentiful, and 1,000 tons of coal can be put on board a vessel in an ordinary day's work, or 1,800 tons in 24 hours working day and night.

Vessels unable to cross the bar can be coaled outside by lighters.

The trade in coal has greatly developed; the harbor is generally crowded with shipping for coal, and there are several coaling stations in each of the three rivers.

Communication.—There are stations of branches of the Inter-colonial railway at Pictou and New Glasgow, which are thus connected with Halifax and Quebec. Steamers of the Quebec Steamship Company leave Pictou fortnightly for Quebec and Montreal, calling at Charlottetown, Summerside, Percé, Gaspé, and Father point. Steamers leave Pictou on Mondays and Thursdays for Magdalen islands, calling at Souris: the Thursday steamer calling also at Georgetown.

A steamer leaves Pictou every Monday night for Cheticamp, calling at Port Hood, Inverness (Broad cove), Margaree, Grand Etang, and Pleasant bay, Cape Breton island.

Pictou is in telegraphic communication with all parts of the United States and Canada, and therefore with the world.

Quarantine and hospital.—Pictou is a minor quarantine station and maintains a marine hospital.

The shore of the gulf from Logan point trends about northwestward $1\frac{1}{4}$ miles to Widow point, which is of sand and shingle, and forms the southern entrance point of Caribou harbor.

Doctor island lies northward of Widow point and, including Doctor spit, extends $\frac{1}{2}$ mile northward and $1\frac{1}{4}$ miles northwestward.

Doctor reef, which dries at low water, extends northeastward $\frac{1}{2}$ mile from Doctor point, the eastern point of Doctor island, and shoal water to the depth of 3 fathoms extends $\frac{3}{4}$ mile farther eastward.

Seal rocks.—Southward of this reef, and about 1,200 yards east-southeastward of Doctor point, lie Seal rocks, which dry at low tide, and from which shallow water, forming the bar of Caribou harbor, extends to Logan point.

Skinner reef is a small, rocky patch, dry at low water, situated about 400 yards northward from the eastern end of Doctor reef.

Buoy.—A red buoy, marked "Skinner reef," is moored in 4 fathoms, 53° , 800 yards from Skinner reef.

Gull and Caribou islands extend northward $\frac{3}{4}$ mile from the end of Gull spit, which is situated 900 yards northwestward of Doctor island; thence 4 miles west to the end of Caribou island. The northern coasts of Gull and of Caribou islands appear from a distance like several islands, but on a nearer approach the wooded parts are seen to be joined together by sand bars. There is a causeway between the western end of Caribou island and the mainland.

The coast of the mainland forming the southern shore of Caribou harbor from Widow point trends west-northwestward for $1\frac{3}{4}$ miles, then west-southwestward $1\frac{3}{4}$ miles to Millbrook, thence northwestward 3 miles to Caribou West gully. It is broken into numerous points and cliffs from 30 to 100 feet high.

The southern shore of the gulf from Widow point to Caribou West gully is formed by the northern coasts of Doctor, Gull, and Caribou islands, which have been described above.

Caribou harbor, between Caribou and Doctor islands and the mainland, is nearly 6 miles long from the southern entrance, between Widow point and Doctor spit, to West gully, and in some parts is 1 mile wide. The whole of this large space is occupied by shallow water, except the narrow channel of the harbor, which is deep enough for vessels of far greater draft than can pass the bar, but does not run through, being lost in mud flats $3\frac{1}{2}$ miles from the southern entrance.

The north entrance to Caribou harbor is situated between the two sandy spits forming the end of Gull and Doctor islands, but it has a depth of only 4 feet at low water.

West gully is dry at low water: about 1 mile within it Caribou river enters the harbor, and is navigable for boats for 2 to 3 miles.

There are settlements and farms along the southern shore of the harbor and upon the inner side of the islands; a road runs from the southern shore of the harbor to Pictou.

The population of East and West Caribou in 1901 numbered 1,295.

The south and vessel entrance to the harbor, between Doctor spit and Widow point, is only 120 yards wide, and the navigable breadth is reduced, by shallow water off Widow point, to 80 yards. The depth here is $4\frac{1}{2}$ fathoms; but an abrupt turn, and a tidal stream running 4 knots, render so narrow a channel extremely difficult. Outside the entrance the channel between the shoals becomes wider, and the depth diminishes gradually to the bar, which is 1 mile seaward, and over which only 9 feet can be carried at low water. The bar and entrance are too difficult and dangerous to be attempted without some special object, and without a pilot.

Oaktree point, a steep clay bank, with a house and barn upon it, is the point of the mainland, $\frac{1}{2}$ mile within the entrance.

Directions.—The northern entrance is now the principal one, but no directions can be given for it. A local pilot is absolutely necessary.

To enter Caribou harbor by the southern entrance, being off the bar and in not less than 5 fathoms water, bring the high water extremes of Widow and Oaktree points in line, bearing 271° , and keep this mark on until over the bar through the low water depth of 9 feet. When Caribou and Doctor points come in line, bearing 324° , sheer immediately northward, and bring Oaktree point and Doctor spit in line, bearing 264° ; keep this mark on until 60 yards from the end of the spit, when sheer southwestward so as to round the spit at the same distance off into the harbor. The channel for the first $\frac{1}{2}$ mile in from the entrance is not more than 180 yards wide, the tide is stronger there, and the bottom not quite so good as farther in, where the channel widens to 260 yards, with a depth of 4 to 7 fathoms, mud bottom.

Tides.—It is high water, full and change, in Caribou harbor at 10h. 0m.: the diurnal inequality causing at times a difference of nearly 2 hours in the two tides of the same day, and also 2 feet in the height of the water. The rise of the highest of the two ordinary spring tides of the same day is 6 feet, and of neap tides 4 feet; there are therefore 15 feet over the south entrance bar at high water ordinary springs.

Light.—A square white lighthouse 26 feet high, on Caribou point, the northeastern point of Gull island, exhibits, at 35 feet above high water, a revolving white light, which attains its greatest brilliancy every minute, and should be seen in clear weather a distance of 10 miles.

Caribou reef, of large stones, which dry for 600 yards northward of Caribou point, is very dangerous, the deep water approaching close to its northern point and eastern side. There is a depth of 3 fathoms $\frac{1}{2}$ mile from Caribou point, and 5 fathoms $\frac{2}{3}$ mile.

Shallow water extends $\frac{1}{2}$ mile off the northern coast of Gull and Caribou islands, and it should not be approached to a depth of less than 5 fathoms.

Pictou island, $4\frac{1}{4}$ miles long east-northeast and west-southwest and $1\frac{1}{4}$ miles wide, is of clay and sandstone, rising in its central parts 150 feet above the sea. It is wooded on the northern side, and there are settlements and farms along its southern coast. Its outline is formed by low cliffs, with the exception of several small bays, and Roger point, on the southern coast, which is of sand and affords the best landing for boats.

In 1901 the population of the island was 159.

West point may be passed in 3 fathoms water at the distance of $\frac{1}{2}$ mile, but there are rocks, nearly dry at low water, just within the 3-fathom line and extending 600 yards offshore both northward and southward of the western end of the island. Shallow water runs out occasionally 600 yards off the northern coast of the island, which at night should not be approached nearer than the depth of 8 fathoms. The southern coast may be approached to 5 fathoms, but from East point a reef, a great part of which dries at low water, runs out $\frac{1}{2}$ mile to the depth of 3 fathoms and nearly 1 mile to 5 fathoms. Not far off this reef, both northward and eastward, there are 9 fathoms; it should therefore be approached with caution at all times, but especially at night, and with a flood or west-going stream.

Clearing mark.—Cole point and Pictou Bar lighthouse in line, 226° , leads southeastward of the shoal water off the eastern end of Pictou island.

Lights.—A square white lighthouse, 32 feet high, on the southeastern point of Pictou island, exhibits, at 52 feet above high water, a flashing white light, which gives 1 bright flash of 1 second's duration every 5 seconds, and should be seen in clear weather a distance of 12 miles.

An octagonal white lighthouse with a red lantern, 49 feet high, on West point of Pictou island, exhibits, at 61 feet above high water, a group revolving white light, showing 3 flashes with intervals of 15 seconds between their points of greatest brilliancy followed by an interval of 30 seconds, the system completing a revolution every minute. The light should be seen in all directions seaward, except where obscured by the island to the eastward, from a distance of 13 miles in clear weather.

NOTE.—A white revolving light attaining its greatest brilliancy every 20 seconds and visible 13 miles is temporarily exhibited from West Point lighthouse until the permanent light is established.

A square white lighthouse, 26 feet high, standing on top of the bank near the western government wharf on the southern side of the island exhibits, at 32 feet above high water, a fixed white light, visible from all points of approach by water and which should be seen in clear weather a distance of 10 miles.

Lifeboat.—A self righting and self bailing lifeboat, 25 feet over all, is stationed about $\frac{1}{4}$ mile northeastward of the lighthouse on the southeastern point of the island.

Wharves.—There are two wharves on the southern side of the island; one near the western end, and one known as East wharf, near the middle. The West wharf is 324 feet long, with a depth of $4\frac{3}{4}$ feet lowest water at its outer end; the East wharf is 328 feet long, with a depth of $4\frac{1}{2}$ feet lowest water at its outer end.

Pictou bank, extending westward and southward, $3\frac{1}{4}$ miles from the western end of Pictou island, is of irregular outline, and of sandstone thinly covered with sand, gravel, mud, and broken shells. The depths are irregular, being from $2\frac{3}{4}$ to 6 fathoms, except on Middle shoals.

Middle shoals are a chain of rocky patches, with 10 feet least water, stretching southwest and northeast, and for $1\frac{1}{4}$ miles across the northern part of the bank, so as to approach within $\frac{1}{2}$ mile of Caribou channel on the one hand, and within $1\frac{1}{4}$ miles of West point of Pictou island on the other. There is but little doubt that $3\frac{1}{4}$ fathoms at low water can be carried through between these shoals and Pictou island, although the irregular soundings forbid absolute certainty.

Buoy.—A red buoy is moored near the 11-foot patch of Middle shoals, approximately in latitude $45^{\circ} 48' N.$, and longitude $62^{\circ} 38' W.$

Clearing mark.—Roger point and West point in line, bearing 89° , leads close northward of Middle shoals in 4 fathoms, but large vessels should not approach them on that side nearer than 7 fathoms. And those navigating small vessels must remember that shallow water runs off $\frac{1}{2}$ mile from West point toward Middle shoals.

Caribou channel, between Caribou reef and Pictou bank, is 1 mile wide between depths of 3 fathoms, or 700 yards wide between depths of 5 fathoms, at its narrowest part, and is from about $6\frac{1}{2}$ to 13 fathoms deep; but its navigation is not easy, because it bends so that no mark leads through it.

Directions.—From the eastward, approach with Pictou Bar lighthouse open southeastward of Cole point, or with the lighthouse in line with the point 226° , which mark leads southeastward of Pictou bank in 5 fathoms, until Caribou Point lighthouse bears 289° ; Hawksbill point is then well shut in by Caribou point. Keep the lighthouse on this bearing, and steer through the channel in not less than 5 fathoms until Mackenzie head is just shut in behind Logan point, bearing 163° , then keep this range on astern, steering across the deep water and along the western edge of Pictou bank to sea.

With a strong southwesterly wind and an ebb stream, keep on the weather side of the channel, in which case steer with Caribou Point lighthouse 289° , until Logan point is only a little open eastward of Doctor point, bearing 157° . These points in line lead along the eastern side of Caribou reef at the distance of 200 yards and in 4 fathoms water. Keep Logan point a little open and it will lead clear out to sea in not less than $4\frac{1}{2}$ fathoms.

For a ship of heavy draft, Caribou Point lighthouse bearing 289° leads rather close to the edge of the southern part of Pictou bank and the northeastern edge of the shoal off Doctor point; the chart and soundings in this case must be the guide.

Caution.—Allow for a strong set over Pictou bank according to the tidal stream.

The coast of the mainland from Caribou West gully trends westward 15 miles to cape John, and is nearly straight, unbroken, and quite free from danger, the shoal water nowhere extending beyond 800 yards off it. Cliffs of clay and sandstone, reaching in some places a height of 50 feet, but usually much lower, predominate, and in fine weather there is good landing for boats almost everywhere.

Cape John has sharp pointed cliffs of sandstone, 40 to 50 feet high, and has extending, 800 yards west-northwestward of it, a reef, on the inner part of which are two rocks always above water. This reef is very steep, especially at its western point, where there are 6 fathoms at low water close to it; this being a greater depth than occurs elsewhere in the vicinity. Off the northern side of the cape shallow water extends $\frac{1}{2}$ mile, and as there are only 15 feet close within the 3-fathom curve, vessels should not approach nearer than the low-water depth of 4 fathoms.

Amet sound is very extensive, affording excellent anchorage for vessels of any size and in any reasonable numbers. Cape John and Mullegash point, its eastern and western entrance points, are $4\frac{1}{4}$ miles apart, but its entrance is divided by Amet and Waugh shoals into three passages, all of which, however, are wide and deep enough for vessels of large draft. The sound contains John bay, Brûlé harbor, Barachois harbor, and Tatamagouche bay.

The shoals and places mentioned will be described and then directions for each passage given.

Amet isle is 460 yards long, about east and west, with a breadth of 80 yards in the widest part, and is divided into two parts, of which the western is the larger; both parts presenting clay cliffs on every side, except where they are joined together by a sandy neck. It is about 20 feet above high water, flat on top, bare of trees, and covered with a coarse grass.

This islet was formerly much larger than at present, and the cliffs still continue to be undermined by gales, high tides, and frosts, so that before long there will remain only a reef of the highly inclined sandstone, which at present forms the base of the islet, and dries out to the distance of about 400 yards, except on the southern side, where boats can generally land at all times of tide. Shallow water extends 600 yards westward of the islet.

Light.—A lantern on the roof of a square white dwelling house, 26 feet high, on the middle of the western part of Amet isle, exhibits, at 44 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 10 miles.

Amet shoals are rocky, with very irregular soundings, and are rendered very dangerous by the fact that they extend nearly 4 miles eastward from the islet, and also 2 miles southeastward. In both directions, at a mile from the islet, there are rocky patches, with 5 to 6 feet water; at a greater distance than 2 miles the depth is not less than 16 feet, except that East patch with that depth lies 73° 3 miles from the lighthouse.

Caution.—The northern side of Amet shoals is very steep, and should not be approached in a large ship, especially at night, to a depth of less than 10 fathoms.

Clearing marks.—Conn house in line with cape John, bearing 205° , leads about $\frac{1}{4}$ mile to the southeastward of East patch in 4 fathoms water; but to clear the eastern end of the patch in a greater depth, keep cape John westward of 214° . This bearing will lead across the $4\frac{3}{4}$ -fathom patch northward of the eastern extreme of cape John. To clear this patch and pass in deep water between it and the 4-fathom patch just to the eastward, keep the western extreme of cape John in line with Brûlé point bearing 218° .

The northern end of the land about Treen bluff, open southward of Saddle island, bearing 264° , leads along the southern side of Amet shoals in $3\frac{1}{4}$ fathoms.

The English church at river John in line with Reef point, 130° , leads westward of the shoals in $3\frac{1}{4}$ fathoms, or Conn house in line with Brûlé point, 171° , leads $\frac{1}{4}$ mile westward of them.

Caution.—The extent of Amet shoals should be remembered when one is in their vicinity, and careful bearings and soundings frequently taken.

Waugh shoal is a rocky bank, 1.2 miles long north and south and $\frac{1}{2}$ mile broad, with irregular soundings of $3\frac{1}{2}$ to 5 fathoms, except toward its northern end, where there is a patch of considerable extent with 2 to $2\frac{3}{4}$ fathoms, 12 feet being the least depth, except perhaps in unusually low tides. This shallowest part of the shoal is very steep, and should not be approached from the northward nearer than the depth of 7 fathoms; but all other parts may be approached to 5 fathoms at low water.

Clearing marks.—For the western side of this shoal there are no clearing marks, the lead and the bearing of the eastern end of Saddle island being the only guides. The eastern end of Saddle island must not be brought to bear to the westward of 194° . The eastern extremes of Amet isle and Cape John peninsula in line 121° or the English church steeple at river John in line with Reef point, bearing 130° , leads close northeastward of the shoal in 5 fathoms. Mullegash and Chamber points in line, bearing 197° , leads southeastward of

the shoal in 4 fathoms, but Chamber point, being very low, is at times difficult to distinguish from the high land behind it.

John bay runs in 4 miles southeastward from cape John to Murphy point, which is the sandy eastern point of John river entrance. The bay is clear of detached dangers, but the shoal water extending from its shores is often very steep, and should be approached very cautiously and not nearer than a low-water depth of $3\frac{1}{2}$ fathoms. Sandy shoals occupy the head of the bay, drying out nearly 1 mile, and extending nearly $\frac{1}{4}$ mile from the entrance of the river to the 3-fathom curve.

River John has only 1 foot at low water over its bar of sand, and irregular depths of 3 to 11 feet, in a very narrow channel up to the bridge, a distance of nearly 1 mile. At Rogers point, 1.3 miles higher up, the river is fordable at low water, and there are deep holes and fords for 5 miles farther to where the tide ends. Vessels are built on the river, and notwithstanding the shallow bar, are taken out light and moored in the bay to load cargoes of lumber which are brought down the river. The vessels lie off the entrance in $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms water, mud bottom; and, although the bay is completely open to the northwestward, are considered safe in summer.

The village is situated on either side of the river, near the bridge, and about $\frac{3}{4}$ mile from the station on the Oxford and Pictou branch of the Intercolonial railway. The English church, with a spire, is about $\frac{1}{4}$ mile eastward of the bridge; and the chapel, with a cupola, is on the opposite or western bank at $\frac{1}{3}$ mile from the bridge toward the river's mouth. On the southern side of the river immediately below the bridge there is a wharf, with a depth of 9 feet at low water along its channel face.

In 1902, 7 sailing coasting vessels of 168 tons entered the river.

Brûlé peninsula.—Brûlé point, the eastern point of the peninsula, bears 225° , distant 3 miles from cape John; and the northern coast of the peninsula, of clay cliffs 10 feet high, extends nearly straight, about west, $1\frac{1}{2}$ miles to Peninsula point, from which a reef drying at low water extends 600 yards to the northwest. The peninsula, which is wooded and rather low, is united to the mainland at its southwestern end by a low and marshy isthmus, and appears from the offing like a low island in the middle of Amet sound.

Brûlé shoals, extending 1.4 miles northward from Brûlé point, are rocky with irregular soundings, and there is a depth of 9 feet water not far within the outer edge. The northern and northwestern sides of these shoals should be approached cautiously, for there is a depth of 4 to 5 fathoms close to the edge, and no good clearing mark; the eastern and southeastern sides may be approached by the lead to $3\frac{1}{2}$ fathoms.

Clearing mark.—The English Church steeple at river John, just open northward of Long point, bearing 110° , leads along the north-eastern side of the shoals in 3 fathoms.

Brûlé harbor runs $2\frac{1}{4}$ miles southwestward within Brûlé peninsula and is nearly 1 mile wide, but the far greater part of it is occupied by flats of mud and weeds. There are 14 feet on the bar at low water and 19 feet for a short distance within, but the channel soon becomes very narrow and divided into several branches.

Conn house stands a short distance inland on the southern shore of the harbor at 171° , 1.3 miles from Brûlé point and about 50 feet above the sea; it is a white two-story house, with a large barn close eastward of it. It appears not to be conspicuous.

Anchorage.—The anchorage outside the bar of Brûlé harbor, in $3\frac{1}{4}$ fathoms, mud bottom, is the most sheltered in the sound. In the best berth Brûlé point bears 301° and Conn house 206° , with cape John in range 26° .

Reef.—A reef, a great part of which is dry at low water, extends 800 yards northwestward from Peninsula point, and it is so bold that there is little warning by the lead.

Barachois harbor.—Chamber point bears 242° , 2 miles from Peninsula point and the entrance of Barachois harbor lies between them. This harbor runs $1\frac{1}{2}$ miles southwestward within Chamber point and then contracts to a very narrow channel, turning southeastward into a shallow lake 1 mile long, with steep banks, and at its head an island. There is a depth of 12 feet over the bar in the narrow channel leading into the harbor. The Barachois is seldom visited by shipping.

Tatamagouche bay, the entrance to which is between Peninsula point and Mullegash point, bearing 335° , $2\frac{1}{4}$ miles from the former, runs in 7 miles westward, affording everywhere good anchorage over soft mud bottom, but with insufficient depth of water for large ships far up the bay. From 5 fathoms at its entrance the depth decreases to 3 fathoms $1\frac{1}{2}$ miles up the bay and to 2 fathoms at 4 miles, the rest of the bay, with the exception of boat channels leading to the Basin and to Millbrook, being all shallow and in part dry at low water. The only detached shoal in the bay is a rock with 7 feet least water, lying 700 yards off the northern shore and 2 miles in from Mullegash point; the northern end of Amet isle and Mullegash point in line bearing 48° leads 200 yards southeastward of it. In the outer part of the bay the shore may be approached to the low-water depth of 3 fathoms and farther in to $2\frac{1}{2}$ fathoms. In entering keep well over to the westward to avoid Brûlé shoals, but remember that shoal water to the depth of 3 fathoms extends nearly $\frac{1}{2}$ mile to the eastward and southeastward from Mullegash point.

Anchorage.—Regard being had to the draft of the vessel, the anchorage is good all over Tatamagouche bay, but that toward the Mullegash shore is the best sheltered from northeasterly winds. A good position is in 4 fathoms. mud bottom and good holding ground, with Amet island 32° , Mullegash point 313° , and cape John 65° .

Tides.—It is high water, full and change, at Tatamagouche bay at 10h. 0m.; springs rise 8 feet, neaps 5 feet.

Tatamagouche river, in the southwestern corner of Tatamagouche bay, and 5 miles from its entrance, is approached through the flats by a very narrow channel which is obstructed by oyster beds, and only 1 foot deep at low water ordinary springs; nevertheless, new vessels of considerable size are brought down it occasionally. The principal settlement in the bay, containing Campbell's shipbuilding establishment and a chapel, stands on the western bank of the river. There is a bridge at 2 miles from the entrance of the river.

Vessels anchor off this river in 11 feet at low water, and as the tide falls ground on the soft mud without injury.

This river and the mill brook in the northwestern corner of the bay contain excellent trout and they also contain alewives during the season for them.

In 1901 Tatamagouche had 341 inhabitants. The port was entered in 1902 by 3 sailing coasting vessels of 185 tons.

Mullegash point, which is the northern point of Tatamagouche bay, has shallow water extending nearly 1,200 yards off the point to the eastward and also northward and nearly 1 mile northwestward to Saddle island.

Saddle island, the eastern end of which lies 1,800 yards north-northwestward of Mullegash point, is low and wooded. It is $\frac{3}{4}$ mile long, east and west, and throughout most of its length is joined to the shore, from which it is distant in one part only about 250 yards, by shoals that dry at low water.

Saddle reef runs out from the eastern point of Saddle island 1 mile to the depth of 3 fathoms. and has on it the Washball, a round-backed rock, dry at low water, and distant 600 yards from the island; but there are only a few feet of water much farther out than the rock. To vessels approaching this reef from the northward, the soundings give little warning, but Treen bluff just open northward of Saddle island, and bearing 256° , just clears it in 4 fathoms. The lead affords the only guide for clearing it to the eastward, where, with care, it may be safely approached to the depth of 6 fathoms.

Directions for Amet Sound.—As the marks for Waugh shoal are difficult to make out, and the other clearing marks are very distant, it is advisable for those without local knowledge to take a pilot into Amet sound.

Eastern passage into the sound, between cape John and Amet shoals, is a little more than $\frac{3}{4}$ mile wide between the 3-fathom curves on either side, with irregular soundings of $3\frac{1}{2}$ to 6 fathoms, and with rock, red sand, broken shells, and mud bottom. It is difficult to carry more than 4 fathoms through at low water.

From the eastward, approach with cape John bearing westward of 214° , and bring that cape and Brûlé point in line, bearing 219° , and keep the range on until Treen bluff opens southward of Saddle island, 264° , when alter course to 244° , passing in 4 to $4\frac{1}{2}$ fathoms nearly through the middle of the passage. The range of Treen bluff just open southward of Saddle island leads southward of Amet shoals in about 19 feet at low water. Do not approach the shallow water off cape John nearer than the depth of 4 fathoms. When through the passage bearings of the points of land will tell the navigator when to change course for any of the different anchorages. Keep the lead going and keep the position of the ship plotted.

Middle passage into Amet sound, between Waugh shoal and Amet isle, is 1 mile wide between the 5-fathom curves on either side, clear of danger, and carries 6 to 10 fathoms water, with sand and mud bottom. Conn house and Brûlé point in line, bearing 171° , leads through this passage.

See preceding paragraph.

Western passage, between Saddle reef and Waugh shoal, is $\frac{3}{4}$ mile wide, with irregular soundings of 5 to $8\frac{1}{2}$ fathoms, the lesser depth being southward of Waugh shoal, where the bottom is rocky and uneven, while further westward it is mud.

In taking this passage, if bound to Tatamogouche bay, avoid the eastern end of Saddle reef when hauling round it to the southward, by not approaching it to less than 6 fathoms water until Treen bluff opens southward of Saddle island, after which round Mullegash point in any convenient depth, and anchor as directed for the bay.

For the anchorage off the bar of river John, run up the middle of John bay till the water shoals to $3\frac{1}{2}$ fathoms, when anchor at $1\frac{1}{2}$ miles distant from the river's mouth. Vessels of considerable size sometimes moor in $2\frac{1}{2}$ fathoms $\frac{1}{2}$ mile farther in.

For Brûlé harbor, after rounding Saddle reef, steer for Brûlé point, or a little eastward of it, until the English church steeple in river John is a little open northward of Long point, bearing 110° ; keep that range on till Brûlé point bears 217° , when steer about 180° , and run by the lead along the southeastern side of Brûlé shoals, in $3\frac{1}{4}$ to $3\frac{1}{2}$ fathoms, until the anchorage outside the bar is reached. A pilot, or previously buoying the channel, is necessary to proceed into the harbor.

In beating through Western passage, the western end of Saddle island may be approached to the depth of 5 fathoms, but its eastern end should not be approached nearer than a depth of 7 fathoms. In the board toward Saddle reef, tack with Treen bluff open northward of Saddle island; and in the board northward toward Waugh shoal, tack when the depth of 5 fathoms is reached. When standing toward Amet isle, attend to the leading marks for clearing the shallow water off it.

Tides and tidal streams.—It is high water, full and change, in Amet sound, at 10 h. 0 m.; springs rise 8 feet, neaps 5 feet. The tidal streams are very weak within the sound, setting regularly up the bays and rivers. In Eastern passage the ebb sets northeastward and the flood in the opposite direction, at rates varying from $\frac{1}{2}$ to $1\frac{1}{2}$ knots. In Middle passage the ebb sets northward and eastward at a rate of less than 1 knot, and the flood westward at the same rate, toward and over Waugh shoal. In Western passage both streams generally set fairly through, the flood westward and the ebb eastward, at rates never exceeding $1\frac{1}{2}$ knots, and usually much less.

Treen bluff is a clifly point, 1.6 miles westward of Saddle island, and from it **Treen reef**, which is of sandstone, stretches out $\frac{1}{2}$ mile to the depth of 3 fathoms.

Clearing mark.—The eastern point of Cape John peninsula open northward of Saddle island, 96° , leads northward of Treen reef in 4 fathoms.

The coast of the mainland from Treen bluff trends west-southwestward 2.4 miles to Gravois point, which is the highest part of the clay and sandstone cliffs in this vicinity. From Gravois point Cantwell point bears about 292° , distant nearly 2 miles, and the coast between the two forms a bight. From Cantwell point the coast trends about northwest for $\frac{3}{4}$ mile to Horton spit, near which is the southern side of the channel into Wallace harbor.

Wallace harbor, at the mouth of Wallace river, has 16 feet over its bar at low water ordinary springs, which rise 8 feet, so that it is capable of admitting vessels of heavy draft, and it is sheltered from all winds. Its entrance, southwestward, $2\frac{1}{2}$ miles from the eastern point of Oak island, and between two sandy spits, named Palmer and Caulfield points, is nearly 400 yards wide, and carries $3\frac{1}{2}$ to $6\frac{1}{2}$ fathoms water; but the approach to this entrance, over the bar and through the bay for a distance of 3 miles, is by a crooked channel, which, although nowhere less than 300 yards wide, is difficult.

On either side within the harbor, flats of stiff red clay extend to the shore and dry at low water, when landing is difficult. At 1,200 yards within the entrance, a middle ground commences and diminishes the breadth of the channel to 100 yards. Nearly abreast the eastern end of the middle ground, there is a narrow channel through

the flats and up Lazy bay, which runs in over a mile southeastward and has, on the shore near its head, cliffs of gypsum 30 feet high.

Wallace, a prettily situated straggling village with its kirk, stands on the southern side of the harbor, about $1\frac{1}{2}$ miles within its entrance. Back of the village the land on the southern shore rises gradually to the summit of a ridge extending eastward, and attaining the height of 400 feet. Opposite Wallace the harbor or river is $\frac{1}{2}$ mile broad, while the channel between the flats is only 60 yards wide, with 5 fathoms water.

At 2 miles higher up, the river divides into two branches, both of which are narrow and obstructed by oyster beds in the channels. The navigation of the North branch terminates $4\frac{1}{2}$ miles above Wallace, where there is a dike or dam, 600 feet long, constructed for the purpose of forming extensive hay meadows. The South and principal branch has a bridge over its entrance, 2 miles above Wallace; it has steep banks of clay and sandstone, and is navigable 6 miles farther to the end of the tide, where in August the bed of the river was nearly dry.

The village has a population of about 800, whose principal industries consist in farming and in quarrying and exporting freestone, of which there are large and valuable beds in the vicinity. To facilitate communication with the northern side of the harbor, which is a thickly settled district, wharves have been built on both shores and a ferry steamer runs between them.

The fisheries are unimportant, but some salmon and alewives visit the river, and a few codfish visit the vicinity of Oak island, where some are caught in May and June.

Oak island, 3 miles north-northwestward of Gravois point, is about $1\frac{3}{4}$ miles long east and west, of irregular shape, low and wooded. Jerry island, small and wooded, lies 1,300 yards westward of it and on the northern side of Fox harbor, just within Mackenzie point.

Shoal water with less than 3 fathoms extends 1,300 yards southeastward of Oak island.

Oak island bar is of sand, and extends from Oak island nearly $2\frac{1}{4}$ miles southward towards Gravois point. Westward of the bar the whole bay is shallow, excepting Ship or Wallace channel. The eastern side of this bar may be approached to the depth of 4 fathoms.

Ship channel, leading to Wallace harbor, is 600 yards wide at its entrance, between the southern point of the bar and the shoal which stretches out 800 yards from Gravois point. From the entrance the channel runs northward and westward, curving round Horton shoal, and passing between it and the shallow water to the northward, which is continuous from the bar to Mullin point. The least depth in the fairway of the channel is 16 feet at low water.

Horton shoal, of sand, stretches out $\frac{1}{2}$ mile eastward from Horton and Cantwell points, and its northern part, drying out 800 yards from Horton spit, can generally be seen.

Horton spit, of low sand, inclosing a marsh, extends 800 yards northward to Horton point, the northern end of this spit, which is bold. The channel passes close to Horton point, and thence trends westward $\frac{3}{4}$ mile to the entrance of the harbor.

Mullin Point range lights.—A square white lighthouse, 25 feet high, on Mullin point, the northern side of Wallace harbor entrance, exhibits, at 39 feet above high water, a fixed white light, which should be seen in clear weather a distance of 11 miles.

A square white lighthouse, 48 feet high, rising through a dwelling 285° 491 yards from the preceding lighthouse, exhibits at 82 feet above high water a fixed red light, which should be seen in clear weather a distance of 8 miles, over a small arc on each side of the range line.

The two lights in line lead over Oak Island bar and into Ship channel.

Marfarlane Point range lights.—A square white lighthouse, 30 feet high, on Macfarlane point, exhibits, at 41 feet above high water, a fixed red light.

A similar lighthouse, 45 feet high, 258° , 620 yards from the preceding lighthouse, exhibits at 100 feet above high water, a fixed red light.

These lights in line, 258° , lead from the Mullin point range line to buoy No. 7.

The lights are visible over a small arc on both sides of the range line, in clear weather, a distance of 4 miles.

Buoys.—Ross Point cask buoy, No. 1, is moored in 23 feet in the entrance of Ship channel with Gravois point bearing 140° , distant 1,133 yards.

Ship Bar cask buoy, No. 2, is moored in 18 feet on the southern edge of Ship bar, with Gravois point 124° , 1.1 miles.

Horton Shoal cask buoy, No. 3, is moored in 8 feet in Ship channel, with Cantwell point 129° , 1,333 yards.

Oak Island Bar can buoy, No. 4, is moored in 20 feet outside Oak Island bar on the line of Mullin Point range lights, with Cantwell point 250° , 1.1 miles.

Fox Harbor Channel can buoy, No. 5, is moored in 21 feet off the mouth of Fox Island channel on the line of Mullin Point range lights, and with the front light 1,566 yards distant.

Mullin Point cask buoy is moored in 26 feet off Mullin point, and with the front range light 335° , 1,000 yards.

Middle Ground can buoy is moored in 27 feet off the southern extremity of Middle ground, north of Lazy bay, with the northern point of Lazy Bay spit 112° , 166 yards.

Graystone Wharf cask buoy is moored in 30 feet of water off Graystone wharf, with the extreme end of the ballast jetty 156° , 166 yards.

Oyster Island cask buoy is moored in 30 feet of water off the eastern end of Oyster island, with the eastern extreme of the island 348° , 350 yards.

Betts Point cask buoy is moored in 30 feet of water off Betts point, with the northern extreme of the point 218° , 266 yards.

Forks cask buoy is moored in 22 feet of water at the junction of the northern and southern branches of the river, with the northern extreme of Betts point 133° , 400 yards.

All the buoys are painted black and white in vertical stripes, and are moored in mid-channel.

Anchorage.—There is anchorage anywhere from 200 to 1,000 yards within the harbor entrance, where the channel is 300 yards wide and carries 3 to 6 fathoms, with mud bottom. Tolerably safe anchorage, sheltered by the bar, on which the sea breaks in heavy weather, may be obtained in 4 to 5 fathoms, mud, northwestward of No. 3 buoy.

Directions.—It is necessary on account of the narrowness of the channel to take a pilot to proceed into the harbor.

Winds from southwest, through south, to northeast, are fair or leading winds into Wallace harbor.

Approaching from the northward, pass Oak island at a distance of fully $\frac{3}{4}$ mile, or in 5 fathoms water, to avoid the reef off its eastern point. Approaching from the eastward, pass Treen bluff 1 mile distant, and in not less than 5 fathoms to avoid Treen reef. In either case, approach the shore about $\frac{1}{2}$ mile eastward of Gravois point, and if entering by ship channel, do not bring the eastern end of Oak island northward of 327° until the southern side of Saddle island is open only 1 degree northward of Treen bluff, bearing 82° .

Then steer for No. 1 buoy, passing close to it on either side, and thence shape courses from one buoy to the next in order, omitting No. 4, or Oak Island Bar buoy, and thus enter over Ship bar in 16 feet at low water. From southeastward of No. 5 buoy, the alignment of Macfarlane Point lighthouses leads to the anchorage; therefore take this range when on.

To enter over Oak Island bar, where there is a depth of 10 feet at low water, bring, while still eastward of the bar, the range lighthouses at Mullin point in line, 283° . Keep this alignment until Macfarlane Point range lighthouses are in line, 258° , when take that range and steer to buoy No. 7 Middle Ground can buoy, on the south-

ern end of the Middle ground; thence proceed to the wharves in the harbor, or anchor at discretion.

Caution.—If the vessel draws more than 15 feet, it will be well, after picking up the Macfarlane Point range, to keep it a little open to the southward, steering rather for the back light, or else steer for No. 6 buoy. Macfarlane Point range kept on leads across the shoal to the southward of Mullin point in 15 feet.

Tides.—It is high water, full and change, in Wallace harbor, at 10h. 30m.; springs rise 8 feet, neaps 5 feet. The rate of the tidal streams is greatest in the entrance of the harbor, and there it does not exceed $1\frac{1}{2}$ knots during summer, while outside in Ship channel it is usually 1 to $1\frac{1}{4}$ knots. The ebb may be somewhat stronger in spring after the melting of the winter snow.

Water in large quantities is not easy to get, the supply coming from wells and springs, which boats can approach only at high water.

Fox harbor.—To the southward of Oak island a bay runs in westward about 2 miles, to Mullin point, which separates Fox harbor on the northwest from Wallace harbor on the south. Fox harbor runs in about $3\frac{1}{2}$ miles to the north-northwest, with a channel through flats of tenacious red clay and weeds, which nearly dry at low water. There are 3 to 4 fathoms water in this channel, but only 8 or 9 feet at low water, springs, over the bar, across which a course 353° will lead.

The coast.—At a little more than 1 mile from the northern extreme of Oak island is Mackenzie point, which is separated from Oak island by sand bars and a gully through which boats may pass except at low water, when it is nearly dry. From Mackenzie point the coast trends northward $\frac{3}{4}$ mile to Smith point, thence west-northwestward $2\frac{1}{4}$ miles to cape Cliff, and thence westward 9 miles to Pugwash point. Nearly all of this coast is unbroken and for the most part composed of clay and sandstone cliffs, 50 feet high, from which the land rises to the summit of a ridge 150 feet high. Along the coast and the ridge are numerous flourishing farms, belonging for the most part to Scotch highland immigrants, and termed the Gulf shore settlement.

Pugwash bay has its entrance between Pugwash point and Lewis head, which bears from the former 262° , distant $2\frac{1}{4}$ miles. Off both of these points are reefs which render great caution necessary in the approach. The rivers Philip and Pugwash, separated by a strip of land 2 miles wide, flow into the bay.

Pugwash reef extends west-northwestward $\frac{3}{4}$ mile from Pugwash point, and dries out a little more than half that distance. There are rocky patches, with 11 and 12 feet water, $\frac{3}{4}$ mile northward and northeastward of the point, and others a full mile out from the shore farther eastward; there is also, 2 miles offshore, uneven rocky ground,

with a less depth than 4 fathoms, which renders it unsafe for a vessel of heavy draft to go within the depth of 5 fathoms.

Lewis reef extends north-northeastward $2\frac{1}{2}$ miles from Lewis head; its outer part is composed of detached rocky patches, on which there are 14 to 18 feet water, with a greater depth between them; but the inner part is shallow, and there is as little as 6 feet water $1\frac{1}{2}$ miles from the shore.

Pugwash road, in the entrance of Pugwash bay, affords excellent anchorage in 16 to 19 feet at low water, sand and clay bottom, and sheltered by Philip bar and Lewis reef from westerly and north-westerly, and by Pugwash reef from easterly and northeasterly, winds; it is open between northwest and north, but the shallow water outside prevents sufficient sea from coming in to endanger a vessel during summer.

Light.—A square white lighthouse, 44 feet high, on Fishing point, the eastern point of Pugwash road, exhibits at 48 feet above high water a fixed light, showing red seaward and white toward the harbor, and should be seen, in clear weather, a distance of 8 miles.

Anchorage.—The best anchorage is directly on the line joining Bergeman and Pugwash points, and with Fishing point 85° , distant nearly $\frac{1}{2}$ mile; but vessels may lie $\frac{1}{2}$ mile farther southward, or close off the bar, in 14 feet at low water. Still farther in, the bay is all shoal, excepting the narrow channel, which curves round its eastern side, and leads to the harbor.

Directions.—While seaward of the shoals, at least 3 miles from the light on Fishing point, and in not less than 5 fathoms, bring Bergeman point, the southern entrance point of river Philip, to bear 214° , and approach with the point on that bearing. When the English church steeple at Pugwash is in line with Fishing point, the eastern point of the bay, bearing 145° , the vessel is about $\frac{1}{4}$ mile from the northwestern end of Pugwash reef; then steer 180° for $\frac{3}{4}$ mile and anchor in 16 to 19 feet at low water, clay bottom.

Caution.—When one is approaching Pugwash road either from the eastward or from the westward a safe rule will be to keep in 5 fathoms or more until the lighthouse on Fishing point bears 180° , then alter course to bring Bergeman point on the bearing given above.

Pugwash harbor, at the head of the bay and at the entrance of the river of the same name, is small, but secure, and has more water inside than on the bar, where the depth is 14 feet at low water ordinary springs. The bar is about $\frac{1}{2}$ mile within the entrance of the bay, and from it a crooked channel, from 100 to 200 yards wide, leads through flats of sand and weeds for the distance of 1 mile to the harbor's mouth. For this channel no directions can be given; a pilot is indispensable, and one can be obtained by making the usual signal.

Pugwash river, immediately within the harbor, extends into a small lake $1\frac{1}{2}$ miles long and 1 mile broad, in which there are several small islands and peninsulas forming scenery of considerable beauty, especially when viewed from the summit of Oxley point, at the inner side of the town. The channel through the lake, between flats of mud and weeds, nearly dry at low water, is 100 to 200 yards wide and has $2\frac{1}{4}$ to 6 fathoms water in it. The river continues navigable for small vessels about 2 miles above the lake and for boats to a distance of 7 miles from its entrance.

On the western side of the lake the narrow channel of Limestone creek leads to quarries of limestone, unfit for building, but which supply Prince Edward island, as well as the neighboring country, with lime.

Tides and tidal streams.—It is high water, full and change, at Pugwash harbor at 10h. 30m.; springs rise 7 feet, neaps 4 feet. The rate of the tidal streams, which is greatest in the entrance of the harbor, does not exceed 2 knots, except perhaps the ebb in spring after the melting of the winter's snow. The rate in Pugwash road is rarely more than 1 knot.

Pugwash.—The village of Pugwash, with its wharves and small wooden English church, stands on the eastern side of the entrance of the harbor. Immediately within there is a fine little landlocked basin, with a depth of nearly 7 fathoms, in which vessels moor in security.

There are no fisheries of any consequence here.

The Intercolonial railway is connected with Pugwash by a branch to Pugwash junction, about $4\frac{1}{2}$ miles inland.

Water.—There is no good watering place at Pugwash, where the supply is from wells, or from springs that are frequently dry in summer.

Philip river enters the sea between Bergeman point and Lewis head. Its mouth is more than $\frac{1}{4}$ mile wide, but a bar of sand and stones stretches across it, leaving only a narrow and tortuous channel with a depth of 8 feet in it at low water. Within the bar a depth of 12 feet at low water can be carried for 5 miles up the river, and depths of 4 to 5 fathoms exist in some places. The channel, between flats of mud and weeds, in some parts is not more than 40 to 50 yards wide. Boats ascend for about 9 miles, at which distance the tide ends, and there is a small rapid. The quantity of water discharged by the river is small, excepting in spring and autumn.

The settlements on both shores are increasing.

Port Howe or Port Philip, a straggling settlement, 3 to 4 miles long, with about 500 inhabitants, and from which much hay, tar, bark, etc., is shipped, is situated on the river about 4 miles westward of Pugwash. A wharf has been constructed.

The coast of the mainland from Lewis head trends northwestward for $8\frac{1}{2}$ miles to Cold Spring head, the southern entrance point of bay Verte, and in this distance there is no place available for shipping. The 3-fathom curve follows the coast at the distance of $\frac{1}{4}$ to 1 mile, and the only detached danger is a spot with 13 feet at low water, $2\frac{1}{2}$ miles 323° from Lewis head.

Light.—A square white lighthouse with a red lantern, 36 feet high, at 35 yards within the northern part of Cold Spring head, exhibits, at 60 feet above high water, a fixed white light, which should be seen in clear weather a distance of 13 miles.

Bay Verte is 9 miles wide across its entrance from Cold Spring head to Indian point, but contracts to the breadth of $2\frac{1}{2}$ miles near its head. It runs in for 11 miles and separates the provinces of Nova Scotia and New Brunswick, whose boundary line crosses the isthmus from the head of bay Verte to Cumberland basin, a distance of about 11 miles. There is no harbor in bay Verte, which is completely open to easterly winds and is very shallow near its head, where flats of mud and weeds dry out to a distance of $\frac{3}{4}$ mile from the shore.

Tidnish river is the most considerable stream in bay Verte, which it enters on the southern side near the head of the bay. It has a depth of only 3 feet of water, in a very narrow channel, when the tide is out, and it is approached by a narrow channel, carrying 3 to 7 feet, through flats of mud and weeds, which dry out a mile from its mouth. Two and one-fourth miles up from its entrance, following the windings of the river, it is crossed by a bridge, and about 3 miles farther up the tide is limited in its ascent by Toby's mill.

In the northern corner of the head of the bay is Gaspereau river, a small stream fit only for boats.

There are thriving settlements on either side of bay Verte, and especially at its head, where extensive tracts of meadow land have been formed by diking out the tide.

Shoals.—The following rocky shoals lie directly in the fairway of the bay:

Aggermore rock, with 18 feet least water, is situated $30^\circ 2\frac{3}{4}$ miles from Cold Spring head.

Laurent shoal, of rock and sand, with 16 feet least water, is about $\frac{3}{4}$ mile long and 800 yards wide. From its shoalest part cape St. Laurent bears 302° , $2\frac{3}{4}$ miles, Ephraim island 290° , and Cold Spring head 185° . The shoal is steep-to on its eastern side, close to which is a depth of 4 fathoms.

Aggermore rock and Laurent shoal are the shallowest parts of an extensive rocky bank, which is thinly covered with sand and extends southward from capes St. Laurent and Spear on the northern side of bay Verte, so as to leave a deep channel about 2 miles wide between

the bank and Cold Spring head. At low water a depth of only $3\frac{1}{2}$ fathoms may be reckoned on between Aggermore rock and Laurent shoal, and also between Laurent shoal and the banks off the northern shore of the bay.

Spear shoal is a bank of sand and stones resting on sandstone, upward of 1 mile long, east and west, and 600 yards broad, with depths of 15 to 18 feet, except on a patch of rock near its eastern end, where there is a depth of only 10 feet and from which cape Spear bears 304° , $1\frac{3}{4}$ miles and Indian point 358° . The lead gives little warning in approaching this shoal from the eastward, on which side there are $3\frac{1}{4}$ to $4\frac{1}{4}$ fathoms close-to; but it is avoided by not approaching it to less water than $4\frac{1}{2}$ fathoms. There are $3\frac{1}{4}$ fathoms of water between it and cape Spear.

Heart shoal, lying about a mile westward from Spear shoal and from which cape Spear bears 12° , $1\frac{1}{4}$ miles, has 6 feet least water; this shoal lies within the 3-fathom line of soundings.

Boss spit, of sand, extends $\frac{3}{4}$ mile from the southern shore of the bay between Boss and Jackson points, and $3\frac{1}{4}$ miles west-northwestward from Cold Spring head; it dries out to its edge, and is so steep-to that there are 17 feet water close to its outer point.

Tides.—It is high water, full and change, at bay Verte, at 10h. 0m.; springs rise 9 feet, neaps 5 feet.

Directions.—In entering bay Verte, keep the Nova Scotia coast aboard, running up in 7 fathoms water, till off Cold Spring head, where, at the distance of about $1\frac{1}{2}$ miles from the shore, southward of the banks and shoals extending southward from cape St. Laurent, the water deepens to 8 and even nearly to 10 fathoms. About 3 miles north-northwestward of Cold Spring head the depth of water decreases to less than 5 fathoms and then continues to shoal gradually, with mud and sand bottom, to the head of the bay. Do not go into less water than $3\frac{1}{4}$ fathoms until past Boss spit or until Cold Spring light bears 141° . Farther up the bay there is no danger, except two patches of stone with 3 and 5 feet water, at 6° , $\frac{1}{2}$ and $\frac{3}{4}$ mile from Tidnish head, which is well in toward the head of the bay on the southern side. There are several ballast heaps at the entrance of the channel of the river, but all are within the 2-fathom curve of soundings.

NEW BRUNSWICK.

Tormentine reefs, which are very dangerous, extend a little more than 3 miles eastward from Indian point, the northern entrance point of bay Verte; but there is rocky ground with $3\frac{1}{2}$ fathoms fully 1 mile farther offshore. A small part of these reefs, which dries at low water, bears 85° , $2\frac{3}{4}$ miles from Indian point; the whole

of Ephraim island open southward of cape St. Laurent leads more than a mile southward of it; but as Ephraim island is difficult to make out, this mark is not of much use.

Nearly midway between the dry part of the reef and Indian point there is a patch of rocks with 7 feet at low water. A depth of $2\frac{1}{2}$ fathoms at low tide can be carried through by small vessels between that patch and Indian point, and shelter may be obtained under the latter in northerly winds; but large vessels, to get under the lee of the point, must pass outside the whole of the reef.

Bell buoy.—A black bell buoy is moored in 6 fathoms $\frac{3}{4}$ mile east-northeastward of the outer dry part of Tormentine reefs.

Tidal streams—Caution.—The tidal streams in the vicinity of Tormentine reefs are strong; the flood stream setting south-southeastward and the ebb north-northwestward. The south-going stream sets over the reefs at the rate of 3 knots, causing a great rippling over the part that dries, and generally indicating its position. During the flood tide the northern side of the reefs must not be approached nearer than a depth of 9 fathoms.

Directions.—To run through the $2\frac{1}{2}$ -fathom channel between Indian point and the dry part of the Tormentine reefs, bring Indian point and cape Spear in line, 131° , and run on that range until the eastern end of cape Tormentine is in line with the western side of the northern Jourimain island, 315° ; then keep this range on a stern until in a depth of 5 fathoms at low water, and southward of the reefs.

Caution.—When in this vicinity one must remember Spear shoal. To keep clear of it, do not bring Cold Spring light to bear to the southward of 220° , unless on the range given above for the $2\frac{1}{2}$ -fathom channel; and do not bring Jourimain Island light to bear to the eastward of 339° , unless well over toward the Nova Scotia shore.

Cape Tormentine is the extreme eastern and central point of the headland which forms the eastern part of New Brunswick, and it is situated about $1\frac{1}{2}$ miles northward of Indian point.

A breakwater pier incloses a basin or harbor of about 4 acres in area, with a depth of 13 to 18 feet at low water. This harbor was constructed for purposes of interprovincial communication between the mainland and Prince Edward island in winter, the distance across to cape Traverse being 9 miles. Communication by steamer between cape Tormentine and cape Traverse is kept up in winter, except when it is prevented by heavy ice.

Cape Tormentine is the terminus of the New Brunswick and Prince Edward Island railway; it has a post-office, telephone, telegraph, a good hotel, Dominion express, a church, and several lobster factories.

Farming and fishing are carried on successfully.

A large number of vessels load here with sawed lumber and products of the sea and farm for foreign ports.

Railway pier.—The railway pier of the New Brunswick and Prince Edward Island railway projects from the coast at cape Tormentine for 2,550 feet seaward, over the shoal which borders the shore. This railway joins the Intercolonial railway at Sackville.

Ice boats.—The ice boats used for the mail service in winter between cape Tormentine and capè Traverse are kept in a square, wooden building, 40 feet high, painted drab, surmounted by a lantern rising from the middle of the roof, the building being situated immediately northward of the inner end of the pier and close to high-water mark.

Beacon—Range mark.—A white, diamond-shaped, slatwork beacon, 10 feet high and 8 feet wide, is placed on top of the freight shed, an unpainted wooden building, 100 feet long and 20 feet high, on the southeastern corner of the railway pier. This beacon, in line with the Baptist Church steeple at cape Tormentine, clears the southern end of Jourimain shoals in a least depth of $5\frac{1}{2}$ fathoms.

Range lights.—A mast on the western side of the freight shed on the railway pier exhibits, at 28 feet above high water, a fixed white light, which should be seen in clear weather from all points of approach a distance of 7 miles.

A square, white lighthouse, 32 feet high, on the bank near the inner end of the pier, 100 feet back from high-water mark, and situated 245° , 873 yards from the preceding light, exhibits, at 46 feet above high water, a fixed white light, which should be seen in clear weather from all directions seaward a distance of 12 miles.

These lights in line, bearing 245° , lead to the pier head clear of the southern end of Jourimain shoals.

Fog bell.—A bell, situated on the eastern end of a small building, on the southern edge of the long part of the pier, 99 yards from its northeastern corner, is rung by hand as a signal to the mail steamer in thick weather.

Telegraph cable.—A telegraph cable crosses the strait from cape Tormentine to cape Traverse.

Jourimain islands, lying off the northeastern part of Cape Tormentine headland, are connected with each other, and with the mainland, by sand bars and marshes; but they appear as islands from a distance that is sufficient to dip the sand bars below the horizon.

Cape Jourimain, the northern extreme of Jourimain islands, is situated about $2\frac{3}{4}$ miles northward of cape Tormentine.

Light.—A white, octagonal lighthouse, 45 feet high, on the eastern end of the southern Jourimain island, exhibits, at 72 feet above high water, a flashing white light, showing a flash every 10 seconds; it is

visible seaward from 103° , through south and west, to 333° , and should be seen in clear weather a distance of 14 miles.

Tides.—It is high water, full and change, at Jourimain island at 9h. 30m.; springs rise 6 feet, neaps 3 feet.

Jourimain shoals extend from about $1\frac{3}{4}$ miles northeastward of cape Tormentine, along the coast off the Jourimain islands and westward to Peacock cove, which is situated about 4 miles westward of cape Jourimain. They are of sandstone, thinly and partly covered with sand, and their southeastern point, a narrow ridge with only 6 feet at low water, is the boldest part of the shoals. The shoals reach 326° $1\frac{1}{2}$ miles from cape Jourimain, and there is a patch of 4 fathoms 338° $1\frac{3}{4}$ miles from that cape; there is also a patch of $3\frac{1}{2}$ fathoms 23° $2\frac{1}{2}$ miles from Peacock cove. The southeastern point of the shoals should not be approached nearer than the depth of 9 fathoms at night, but farther westward the shoals may be approached with proper caution to 6 fathoms at low water.

Buoy.—A conical red buoy is moored in 7 feet water off the southeastern point of Jourimain shoals. This buoy is replaced in winter by a red spar buoy.

Anchorage.—Southward of Jourimain shoals, and between them and Tormentine reefs, there is good anchorage with westerly winds in 5 to 6 fathoms, sand bottom, with clay underneath.

Cape Bruin lies $6\frac{1}{2}$ miles westward of cape Jourimain, and in the bay between them there is good anchorage, with southeasterly, through south, to westerly winds, in 5 fathoms, sand.

Caution is necessary in approaching this coast on account of Jourimain shoals.

Little Shemogue and Shemogue rivers, $3\frac{1}{2}$ miles and $6\frac{1}{2}$ miles, respectively, westward of cape Bruin, having narrow and intricate channels, over shifting bars of sand, are suitable only for boats and very small vessels. During the survey, at springs, 8 feet could be carried in over the bar of the former, and 10 feet over that of the latter.

Anchorage.—Off these rivers, in the bay between cape Bruin and cape Bald, the latter bearing from the former 284° nearly 12 miles, there is good anchorage in 5 to 6 fathoms, sand bottom. Shoal water of less than 3 fathoms extends only about $\frac{1}{2}$ mile off the coast, which may be approached at night to the depth of 6 fathoms at low water.

Cape Bald, a sandstone cliff, 40 feet high, is bold, and may be approached by the lead to the depth of 5 fathoms.

Cape Pillet church, with its square tower, $1\frac{1}{2}$ miles south-southwestward of the cape, forms a conspicuous mark from seaward.

Bouleaux point is $6\frac{1}{2}$ miles westward of cape Bald, and shoals extend over 1 mile off it.

Kouchibouguet and Bouchagan rivers, in the sandy bay between cape Bald and Bouleaux point, and $5\frac{1}{2}$ miles westward of cape Bald, are small, and can be entered by boats only at high water.

Shediac bay is $6\frac{1}{2}$ miles wide from Bouleaux point to Shediac point, which is a low sandstone cliff and runs in about 5 miles. It contains several shoals and has less than 3 fathoms in its greater part. It is therefore unsuited to large vessels.

The shore of the bay from Bouleaux point trends westward $4\frac{1}{2}$ miles to Chêne point; thence southwestward 2 miles to the head of the bay; and from Shediac point south-southwestward 2 miles to Grandigue point; thence southwestward 1 mile and then southward $4\frac{1}{2}$ miles, making the head of the bay.

Shediac island, the northern end of which bears 188° 1,400 yards from Grandigue point, and Snake point, the southern end of the island, 321° , 900 yards from the northwestern end of Chêne Point breakwater, extends north and south nearly 2 miles across the western part of the bay.

Bank.—A rocky bank, with 10 feet least water, lies 129° nearly 1 mile from Gulnare point, the northeastern point of Shediac island.

Medea rock, situated 51° , 2 miles from the northern part of Chêne point, and 400 yards within the line joining Shediac and Cocagne points, is very small, with 7 feet least water; there are $2\frac{1}{2}$ to 4 fathoms water for 200 yards around it, excepting to the southward, in which direction there are several rocky patches, with 12 feet water, between the rock and the shore; which is nearly $1\frac{3}{4}$ miles away.

Buoy.—A can buoy, painted red and black in horizontal stripes, is moored in 8 feet water at 100 yards north-northeastward of the shallowest part of Medea rock; it may be left on either hand by vessels drawing less than 12 feet.

Zephyr rock, 23° nearly $1\frac{1}{2}$ miles from the northern part of Chêne point, and 273° a little more than 1 mile from Medea rock, is also very small, with 9 feet least water. From about $\frac{1}{2}$ mile southward of the rock to the shore there is a depth of 11 to 14 feet water.

There are from 14 to 22 feet of water between Medea and Zephyr rocks, but the best channel is west-northwestward of them.

Lightbuoy in autumn.—A black cylindrical lightbuoy, showing an intermittent white light at short intervals, is moored, during autumn only, in 19 feet water, 400 yards northward of Zephyr rock.

Buoys.—A can buoy, painted red and black in horizontal stripes, is moored, in 18 feet water, 200 yards westward of Zephyr rock. It may be passed on either hand.

A black can buoy is moored, in 17 feet water, on the northern end of the shoal about $\frac{1}{2}$ mile south-southwestward of Zephyr rock.

Shediac North Channel range lights.—A square white lighthouse with a red lantern, 27 feet high, on the northern part of Chêne point, exhibits, at 32 feet above high water, a fixed red light, which should be seen in clear weather a distance of 7 miles.

A square white lighthouse with a red lantern, 39 feet high, 192° , 201 yards from the preceding lighthouse, exhibits, at 43 feet above high water, a fixed red light, which should be seen in clear weather a distance of 8 miles. These lights are visible on and over a small arc on either side of their alignment, which leads through Shediac North channel to the westward of Zephyr rock, and to the intersection of the range line of these lights with that of the Shediac Island range lights.

Shediac Island range lights.—A square white lighthouse with a red lantern, 37 feet high, on the eastern coast of Shediac island about 900 yards from Snake point, exhibits, at 36 feet above high water, a fixed white light, which should be seen in clear weather a distance of 11 miles.

A square white lighthouse with a red lantern, 47 feet high, 264° , 207 yards from the preceding light, exhibits, at 52 feet above high water, a fixed white light, which should be seen in clear weather a distance of 12 miles.

These lights are visible on, and over a small arc on each side of, their alignment, as well as toward the harbor, and in line they lead toward Shediac harbor to the southward of Medea and Zephyr rocks, to the intersection of their range line with that of Shediac Harbor range lights.

NOTE.—On Shediac island there are two conspicuous trees, situated $\frac{1}{2}$ mile north-northeastward of the range lighthouses; these trees may show in misty weather when the lighthouses are not visible.

Shediac harbor is the only port on this part of the coast which a vessel in distress can run for as a harbor of refuge.

The harbor lies between Chêne point and Snake point, which is 1,400 yards northwestward of it. The space in the harbor where shipping may moor, in 13 to 16 feet at low water, is about 1,200 yards long and 300 to 600 yards wide; but the harbor is much more extensive for vessels of light draft, although encumbered by ballast heaps. The depth that can be carried into the harbor under ordinary circumstances is 15 feet at low water ordinary springs; and the bottom, both in the channel and harbor, is mud and sand.

The deep part of the harbor is safe except during the rare northeasterly gales of autumn, when instances have occurred of all vessels, at anchor and moored to the wharf, being driven on shore.

A swell is felt in the harbor at high water in a northeasterly summer gale; but it is never sufficient to endanger a vessel with good anchors and cables. A well-equipped vessel would ride safely through any moderate summer gale, even in the bay just outside the bar.

Chêne bank.—A sandy bar runs out 1,600 yards northward from Chêne point, and at three-quarters ebb is dry for nearly half that distance. This bar and the shoal off the southeastern part of Shediac island render the harbor secure.

The entrance between the northern point of the bar and the shoal water off the island is the narrowest part of the channel, and is there 250 yards wide, between depths of 12 feet on either side. A channel, 100 feet wide, has been dredged to a depth of 15 feet at low water from the line of Shediac Island lights to the wharf, and a basin, 360 feet in length and 140 feet in width, in front of the wharf, has been dredged to a depth of 19 feet at low water.

Deep hole, with 19 feet at low water, is situated 14° , 1,300 yards from the northwestern corner of the government breakwater. Vessels anchor in it to complete their cargoes or to await a tide high enough to enable them to leave. Eastward of Deep hole the water shoals rapidly to 10 feet on Chêne bank.

Wharf.—A wharf 1,950 feet long, on which terminates the Inter-colonial railway from Moncton, extends from Chêne point. Its outer end divides into two parts, making a safe dock. An inner and outer breakwater, each 600 feet long, with an opening 80 feet wide between them, have been constructed about 400 feet from the northeastern side of the wharf, and a ballast wharf (so called), 200 feet long, connects the outer breakwater with the wharf.

Harbor range lights.—An iron mast, 29 feet high, with a shed at the base, on the northwestern corner of the government breakwater, and 120 yards northeastward of the outer end of the northern arm of the railway wharf, exhibits, at 32 feet above high water, a fixed white light, which should be seen in clear weather a distance of 6 miles.

A similar mast, 37 feet high, with a shed at the base, on the outer end of the southern arm of the railway wharf, and 195° , 207 yards from the preceding mast, exhibits, at 38 feet above high water, a fixed white light, which should be seen in clear weather a distance of 6 miles.

These lights in line lead from the intersection of their range line with that of Shediac Island range lights to the wharves in Shediac harbor.

Buoys.—A red can buoy is moored on the edge of the shoal water extending southeastward of Shediac island, with the front light-house on that island bearing 254° , 1,500 yards.

A red can buoy is moored on the edge of the same shoal with the front lighthouse on Shediac island bearing 259° , 900 yards.

Three red buoys are moored northwestward of Chêne bank and immediately westward of the line of the railway wharf (harbor) range lights.

Tides.—The tides in Shediac bay are extremely complicated. The establishment, at the only full and change period observed, was 0h. 0m. The highest tides occur at full and new moon, and rise 4 feet above the lowest water. At other times the rise³ of tide is about 3 feet. Low water occurs at intervals, varying from 1 to 18 hours after high water, and ranges from 3 inches to 4 feet. The streams generally are weak.

Pilots.—Pilotage is compulsory in Shediac harbor; the charge inward or outward is \$1.50 per foot draft of water.

Ice.—Shediac bay is generally frozen over from the first week in December until the end of April, being completely closed between those dates. The first vessel arrives, from sea, about April 30, and the last one leaves about December 8.

Directions.—Vessels entering Shediac harbor take a pilot; if one cannot be obtained, observe the following directions, which lead in through a least depth of 15 feet at low water; but the channel from the line of Shediac Island lights to the wharf is very narrow.

From the eastward, and while eastward of Medea rock (Cassie Point light kept bearing to westward of 328° will insure this), bring and keep the lighthouses on Shediac island, or their lights at night, in line, bearing 364° , and steer on the range, passing about 400 yards southward of Medea rock, and close to the black buoy on the northern side of the shoal southwestward of Zephyr rock; leave this buoy on the port hand. Continue with the range on until near the western red can buoy, or until the range-light masts on the railway wharf and breakwater, or their lights at night, are nearly in line, when alter course to the southward, so as to bring them in line, bearing 195° , and keep this range on, passing eastward of the three red buoys in the channel northwestward of Chêne bank.

By day, when the cliff of cape Brûlé is in line with the end of the grass off Chêne point, bearing 102° , sheer westward, and anchor; by night, proceed for rather more than $\frac{1}{2}$ mile, with the railway wharf range lights in line, and then anchor slightly eastward of that line. The railway wharf and government breakwater light masts or lights in line lead to the wharf.

From the northward, after passing eastward of Grandigue bank and while northward of Zephyr rock, steer to bring the range lighthouses on Chêne point, or their lights at night, in line, bearing 192° . Keep this range on until the range lighthouses on Shediac island are

nearly in line, then bring them in line ahead and proceed as above directed.

When the lightbuoy is in position it may be approached while bearing between 259° and 214° ; pass northward of it and bring the lighthouses on Chêne point in line; then proceed as above directed.

The masts on the government breakwater and the railway wharf, from which the inner range lights are shown, are often hidden by the masts of vessels lying alongside.

Shediac village, which is situated on the southeastern shore of Shediac bay, contains four churches, the most conspicuous from seaward being the Episcopal and Roman Catholic, which are surmounted by spires, and stand at the eastern end of the village. The Methodist also has a spire, and is situated in the middle, while the Presbyterian, a white building with a square tower, is near the western end of the village. Westward of Scoudouc river entrance is a Baptist church, a yellow building with a small tower, and northward of it is Cape church; neither of these is visible from seaward.

Upper Grandigue village and church are situated on the mainland northwestward of the northern end of Shediac island.

Scoudouc and Shediac rivers, in the southern and northwestern corners of the bay, respectively, are small streams navigable for boats to a few sawmills situated a few miles up at the head of the tide. There are bridges across each of these streams near their mouths, where there are oyster beds. There are also oyster beds, and beds of other shellfish, in many parts of the bay.

The country about Shediac, which is fertile and well settled, consists of undulating ridges of clayey loam, attaining the height of 150 feet, and resting on the sandstone of the coal formation.

There is a good road for 14 miles across from Shediac to Moncton town, at the bend of Petitcodiac river.

Chêne point is the terminus of a branch of the Intercolonial railway and the entrepôt of trade to Prince Edward island. A small village has been built there and contains several stores and two or three hotels, one of which is surmounted by a tower and flagstaff. The place is much resorted to for bathing in summer. Its population is about 250.

Storm signals are exhibited at Chêne point.

Communication—Telegraph.—Steam vessels of the Prince Edward Island Steam Navigation company run every day between this port and Summerside while navigation is open and connect with the trains. It is connected with Halifax, St. John, and Quebec by the Intercolonial railway. Chêne point has telegraphic communication with all parts of Canada and the United States.

Water, which is very scarce and not at all good at Shediak, may be bought from a contractor or it may be obtained with difficulty at high water from Scoudouc river.

Supplies of all kinds may be obtained at Chêne point.

Coal.—About 60 tons of coal are usually kept in store at Chêne point by the railroad company, and any quantity can be procured from Pictou in about 1 day.

Port charges.—Pilotage, \$1.50 per foot; harbor master's fee, \$4; health visit, \$5; tonnage dues, 2 cents per ton.

Trade.—The exports consist of lumber, salmon, potatoes, and oats.

Repairs.—There are no facilities for repairing vessels at Shediak.

Channel.—The channel to the mouth of Shediak river, northward of Shediak island, is very shallow, and winds through flats covered with eel grass; it can be utilized only by fishermen with local knowledge. It is marked by 13 spruce bush beacons on the southern side and 13 birch bush beacons on the northern side, and at the point where the channel crosses the bar it is marked by two cask buoys, a red buoy on the northern side off the northeastern corner of Seal bank in 6 feet water and a black buoy on the island side in 5 feet water.

Shediak point, the northern point of the bay, is a low sandstone cliff. Cassie point is situated about 400 yards southward of it.

Light.—A square white lighthouse, 27 feet high, with a dwelling attached, on Cassie point, exhibits, at 47 feet above high water, a revolving white light, which attains its greatest brilliancy every 30 seconds, and should be seen in clear weather a distance of 12 miles.

Fog signal.—A hand horn answers vessels' signals.

Anchorage.—There is good anchorage under Shediak point in northwesterly winds, in 18 feet, mud bottom.

Grandigue bank, with 14 to 18 feet water over it, rock bottom, extends 2 miles eastward from Shediak point, and has its shoalest part near its outer edge. Excepting by small craft, this bank should not be approached to a depth of less than 5 fathoms.

The coast from Shediak point trends north-northwestward for 2 miles to Cocagne head, and thence about northwestward for $1\frac{1}{4}$ miles to Renouard point, which is composed of reddish sandstone cliffs 50 feet high.

Cocagne harbor entrance is between Renouard point and Pacquet point, the southeastern point of Cocagne island, bearing 315° , 1,400 yards from Renouard point. The harbor is very small, and the channel over the bar of sand, gravel, and sandstone is narrow and

crooked, with 10 feet at low water ordinary springs. Within the bar there is a depth of $2\frac{1}{2}$ to 4 fathoms for about $\frac{3}{4}$ mile in a very narrow channel, where vessels moor. Farther in, the bay, which extends southward $2\frac{1}{4}$ miles from the island with a width of $1\frac{1}{2}$ miles, is shallow, with oyster beds and mud flats, covered with 4 to 6 feet water.

To enter this harbor fine weather is absolutely necessary and a pilot is indispensable.

Cocagne river enters the head of the bay 3 miles southwestward from the harbor's mouth. It is crossed by a bridge just within its entrance, and is navigable by boats for several miles. The shores of the harbor and river are well settled by families of Acadian and British extraction, principally engaged in agriculture. Cocagne church is situated on the shore of the harbor 900 yards northward of the river entrance.

Range lights.—A square white lantern, surmounting a square white inclosed building on the southern shore of the mouth of Cocagne river, exhibits at 26 feet above high water a fixed red light, which is visible from all points of approach, and should be seen in clear weather a distance of 6 miles.

A pole surmounted by a diamond-shaped daymark, and situated 120° 288 yards from the above light, exhibits at 47 feet above high water a fixed red anchor lens-lantern light, which is visible from all points of approach from seaward, and should be seen in clear weather a distance of 8 miles.

These two lights, in line bearing 120° , lead in from Northumberland strait to the anchorage ground in Cocagne harbor, and thence across the bay to the approach to Cocagne bridge.

Directions.—When approaching Cocagne harbor from the eastward, keep in 6 fathoms water until Cassie Point light bears 196° . This is to avoid Grandigue bank and the shoal that extends $1\frac{1}{2}$ miles to the eastward from Cocagne head. When Cassie point bears 196° haul to the westward and run in 4 fathoms until the Cocagne Harbor range lights are nearly in line; then change course to the southwestward to bring the range on, and stand in across the bar in 10 feet at low water with the range on. Proceed to the anchorage, keeping the range on, or, if desired and the draft permits, to the mouth of the river. To enter the river, unless one has local knowledge, a pilot is necessary.

The anchorage is in 16 feet, with Pacquet point 23° , distant 1,400 yards, and Renouard point 76° .

When approaching from the northward avoid the northern end of Buctouche outer bar by keeping in at least 5 fathoms until the light on Buctouche sand bar bears 226° , then change course to 180° and

run down in 4 fathoms until the Cocagne Harbor range is nearly on, when proceed as above directed.

The coast of Cocagne island, which is 60 feet high and thickly wooded, trends about northwest 1.9 miles, whence sand banks, nearly dry at low water, connect its northern end to Dixon point, a small, low, rocky peninsula, 1 mile farther northward.

The coast of the mainland inside of Cocagne island from the north point of the mouth of Cocagne river trends northward for $4\frac{1}{4}$ miles to Dixon point, and thence northwestward 3.9 miles to Giddis point.

Buctouche outer bar is a ridge of sand and rock, with $2\frac{1}{4}$ to $2\frac{3}{4}$ fathoms water over it, beginning 1,600 yards northeast of Pacquet point and extending thence northward parallel to the shore for 7 miles. Between the bar and the land there is a narrow channel with depths of $3\frac{1}{4}$ to 5 fathoms.

North patch, of rocks, with 12 feet least water, is small, and has a depth of 5 fathoms close outside it. It lies 2 miles offshore on the northeastern point of the outer bar with Cocagne church and the northwestern end of Cocagne island in line, bearing 190° , and Buctouche church bearing 256° .

Indian point, or Church point, bears 349° , $1\frac{1}{4}$ miles from Giddis point.

Buctouche sand bar commences on the coast about $3\frac{1}{2}$ miles northward of Indian point and takes a southeasterly direction for 6 miles, or to $2\frac{1}{2}$ miles from Dixon point.

Light.—A lantern above the roof of a square white lighthouse, 35 feet high, on the southern end of Buctouche sand bar, exhibits, at 38 feet above high water, a fixed white light that should be seen in all directions of approach in clear weather a distance of 11 miles.

Buctouche road, off the entrance of Buctouche river and in the widest part of the channel within the outer bar, is a safe anchorage for vessels with good ground gear; the bottom is a tenacious clay and the outer bar prevents any very heavy sea from coming in. Vessels drawing too much water to enter the river moor here.

Directions.—Vessels that do not draw too much water pass over the outer bar, excepting North patch; larger vessels approach from the northward in not less than $3\frac{1}{2}$ fathoms as follows:

Bring Buctouche church to bear southward of 248° , and run in shore on that course, passing northward of North patch, until Cocagne church is in line with Dixon point 185° ; change course at once to this range and keep the range on, passing close inside the outer bar, and clear of a small shoal lying between the bar and the shore and on which there are 17 feet water. While running along the sand bar,

be careful not to shut the church in behind Dixon point; immediately after Buctouche church opens southwestward of the small sandy islet which forms the southwestern point of Buctouche sand bar, anchor in 22 to 24 feet water, with the breadth of Cocagne church open eastward of Dixon point and Dixon Point range lighthouses in line 282° .

Dixon Point range lights.—A square white lighthouse, 30 feet high, on the shore 3 miles northward of Dixon point, on the southern side of the entrance to Buctouche river, exhibits, at 36 feet above high water, a fixed white light that should be seen in clear weather a distance of 11 miles.

A square white lighthouse, 34 feet high, 350 yards 282° from the preceding lighthouse, exhibits, at 41 feet above high water, a fixed white light that should be seen in clear weather a distance of 12 miles.

These lights in line, lead across the inner bar into Buctouche harbor.

Indian Point range lights.—A square white lighthouse with a red roof, 23 feet high, on Indian point, exhibits, at 23 feet above high water, a fixed white light that should be seen when in alignment with the following light in clear weather a distance of 9 miles.

A square white lighthouse with a red roof, 23 feet high, 660 yards 313° from the preceding light, exhibits, at 53 feet above high water, a fixed white light that should be seen, when in alignment with the preceding light, in clear weather a distance of 12 miles.

These lights in line lead from intersection with Dixon Point range through the channel to where it turns abruptly westward to enter Buctouche river.

Buoy.—A large black can buoy is moored in 3 fathoms water on the western side of Buctouche road 1,600 yards 158° from Buctouche sand bar lighthouse.

Buctouche river flows southeastward through the shallow bay within Buctouche sand bar into the sea. At its mouth, and southwestward of the southern end of the sand bar, is a bar of sand and flat sandstone, with a depth of 7 feet at low water ordinary springs. Within this bar is a wide part of the channel where vessels ride safely in $2\frac{1}{2}$ and 3 fathoms, mud bottom; off Giddis point the channel becomes narrow, with a depth of 7 feet at low water. The channel of the river in its course through the bay is narrow, intricate, and encumbered with oyster beds; higher up the channel is free from obstruction, and in some places has 5 fathoms water. Vessels ascend about 10 miles above the bar, and boats 14 miles, where the tide ends.

Buctouche village, where considerable trade is carried on in lumber, coal, fish, etc., is situated about 4 miles up from the river entrance. A mile above Buctouche church there is a drawbridge.

The country in the vicinity of Buctouche river attains an elevation of about 200 feet above the sea. The banks of the river are well settled, principally by Acadians, and the clayey soil is very fertile. There are saw and grist mills at the head of the tide.

The terminus of the Buctouche and Moncton railway is at Buctouche.

Buoys and beacons.—On the southern edge of North bank, which is to the southward of Buctouche sand bar, is moored a red can buoy.

On the southwestern extremity of North bank is moored a red conical buoy.

On the northern extreme of Mussel bank is moored a black cask buoy.

On the extreme of Mud point on the northern side of the channel is moored a red cask buoy.

A sunken wreck is marked by a black cask buoy.

The turn of the channel to the westward is marked on its southern side by a black cask buoy.

Between the turn of the channel and Priest point the sides of the channel are marked by bushes on the northern side and black pickets on the southern side, all driven into the mud banks.

The extremity of Priest point is marked by a red cask buoy.

From Priest point to the bridge the sides of the channel are marked by bushes on the northern side and by black pickets on the southern side.

Directions.—A pilot, or local knowledge, is absolutely necessary to get up the river. The Dixon Point Range lighthouses or lights in line guide into the river until the Indian Point lighthouses or lights are in line; and that range leads into the river through the deepest channel to where the channel turns abruptly westward. But it must be observed that the channel is subject to change in easterly gales or from ice settling on the bar in winter.

Tides.—It is high water, full and change, at Buctouche at 7h. 0m.; springs rise 4 feet and neaps 2 feet; both time and rise are only approximate.

Wharf.—At Buctouche there is a wharf about 300 feet long, with a depth of 17 feet along its face. It runs parallel to the bank and is situated immediately below the road bridge across the river; the back of the wharf has a branch of the railway close to it.

Richibucto head, north-northwestward $12\frac{1}{2}$ miles from the southeastern end of Buctouche sand bar, is of sandstone and clay cliffs, 50 feet high.

Shockpish river, in the bay between the sand bar and the head, and $4\frac{1}{2}$ miles southward of the head, affords shelter to boats at high

water. In 1903 the entrance channel of this river was 70 feet wide with a depth of 9 feet at high water.

Light.—A square white lighthouse, 50 feet high, on Richibucto head, exhibits at 70 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 14 miles.

The coast from Richibucto head trends northward for about 2 miles; it then turns west-northwestward for $3\frac{1}{2}$ miles to the entrance of Richibucto river.

Reef.—A sandstone reef extending about 1 mile offshore at Richibucto head, continues about 3 miles to the northward.

Richibucto river is, among the rivers on the eastern side of New Brunswick, inferior only to the Miramichi, either in the distance to which it is navigable, or in the depth of water over its bar.

The entrance of the Richibucto is about 700 yards wide; it lies between two sand bars, several miles in length, called the north and south beaches, on which there are sand hills 30 feet high. Immediately within the entrance there is a wide expanse of mud and weeds, nearly dry at low water, except in the channel of the river. On the northern side, a shallow bay leads, within the north beach, to lagoons; while on the the southern side, within the south beach, lies French island, and southward of its eastern end, French creek and Low village, where there is a church, visible in some directions seaward. Within the wide part of the Richibucto its breadth is rendered irregular by numerous bays on either side. About 3 miles within the entrance and just below Richibucto town the river is over 800 yards wide, but it contracts to 300 yards, $1\frac{3}{4}$ miles farther up, after which it expands again for a considerable distance and, nearly to the end of the navigation is nowhere less than 160 yards broad, although the channel between mud banks, nearly dry when the tide is out, is much narrower. Low cliffs of sandy clay are frequent on either side of the river, but the adjacent country, although undulating, does not exceed 80 or at the most 100 feet above the sea.

There are flourishing and increasing settlements on its banks, as well as on those of its principal tributaries, the rivers Aldouin, St. Nicholas, and Molus, which, however, are of no importance for navigation. The population, of English, Scotch, Irish, and Acadian extraction, are engaged in agriculture and lumbering, but they do not prosecute the fisheries. Traces of coal are reported to have been found in the sandstone, which forms the substratum of this and the neighboring country.

Aldouin river enters on the northern side at about 2 miles within the entrance of the river.

Richibucto river is navigable for boats nearly to the head of the tide, a distance of about 22 miles, following the stream in a general southwesterly direction. Vessels able to enter the river can be taken

about 13 miles up from the entrance: the depth in the channel varying in that distance from 3 to 9 fathoms, over mud bottom. Smaller vessels ascend to 2 miles below the head of the tide, where the river is very shallow and rapid at low water.

The bar extends about 2 miles from north beach eastward, or parallel to south beach, no part of it being as much as a mile seaward of south beach; there is a rock in its eastern part, but the remainder is sand, dry at low water.

There is a narrow channel over the bar, which commences at $1\frac{1}{2}$ miles eastward of the river's mouth, but it shifts with gales and the action of the ice. The least depth in the fairway of the channel in 1905 was 13 feet.

Range lights—Bar.—A mast, 40 feet high, on the southern side of south beach at about $\frac{3}{4}$ mile eastward of the river entrance, exhibits, at 46 feet above high water, a fixed white light, that should be visible from a distance of 12 miles on the leading line in clear weather.

A lantern on a mast, on the northern side of south beach, exhibits at 35 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 10 miles on the leading line.

NOTE.—An old light tower, with a dwelling attached, is situated near these masts, but no light is shown from it. The positions of the leading lights are altered as necessary to suit the channel.

Channel.—A lantern on a mast with a white shed at its base, on the western end of south beach, exhibits at 27 feet above high water a fixed white light, that should be seen on the leading line, in clear weather, a distance of 5 miles.

A lantern on a mast, with a white shed at its base, exhibits at 32 feet above high water a fixed white light, that should be seen, in clear weather, a distance of 5 miles on the leading line.

These light are shifted as necessary to suit the channel.

Buoy.—A black bell-buoy is moored in 5 fathoms, with the bar range light masts in line and at 1 mile from the front mast.

Anchorage.—There is open anchorage off the bar in 9 fathoms, fine, brown and gray sand, which affords far better holding ground than there is nearer the shore.

Pilots.—The branch pilots of Richibucto river are able, and from the beach at the mouth of the river they keep a good lookout for vessels.

Directions.—The bar may be safely approached from seaward to the depth of 6 fathoms at any time of tide.

To enter the river a pilot is absolutely necessary, since the bar is subject to change. The following directions are approximate:

Approach with the bar range light masts in line and steer on the range for the black bell-buoy at the entrance to the channel over the

bar. Keep this mark on until the light masts on the western end of the south beach are in line. These light masts are then kept in line for a distance of $\frac{3}{4}$ mile, when the first black spar buoy is reached. From this point to the town the channel is tortuous and is marked by buoys. The channel through the reef and Jib Sheet shoals, as the turn northward of the channel range light masts is locally called, has been dredged to a depth of 13 feet for a width of 100 feet.

Caution.—Entering the river with the flood is attended with no other difficulty than that arising from the narrowness of the channel. but to a large, deep, and dull sailing vessel outward bound, the bar is dangerous. As she leaves at high water of the highest springs, if the wind becomes unsteady or light, she is almost certain to be drifted ashore by the ebb stream on the southeastern part of the bar; and should a northeasterly gale then occur, she is liable to become a total wreck.

Tides.—It is high water, full and change, at Richibucto river at 3h. 30m.; springs rise 4 feet. neaps $2\frac{1}{2}$ feet.

On the day of the full moon, in July, 1839, there was only one high water, at 3h. 30m. a. m., and one low water, at 4 p. m. But toward the time of neap tides, two high waters in 24 hours became apparent for a few days; this is caused by the two interfering tide waves.

The rate of the tidal streams in the river is $1\frac{1}{2}$ to 2 knots.

Richibucto town, situated on the left bank of the river, 3 to 4 miles above its entrance, is the capital town of the county of Kent, and contains a church, chapel, court-house, etc. There is a chapel on Hughes point, $1\frac{3}{4}$ miles above the town, and opposite it, on the right (southern) bank of the river, is Jardines wharf, together with a village of Micmac Indians who are employed as laborers and choppers. A highway bridge which has a central span of 308 feet crosses the river between Hughes point and Jardines wharf. There is a station of the Kent Northern railway at Richibucto.

The town of Rexton, with about 1,000 inhabitants, is situated on the right bank of the river about 3 miles above Richibucto town. It has a wharf which is immediately above the highway bridge.

Kouchibouguac bay, which lies between Richibucto point, the southeastern end of south beach, and point Sapin, bearing 349° , $17\frac{1}{2}$ miles from the former, runs in $5\frac{1}{2}$ miles. The shores of the bay are very low, with sand bars and beaches, inclosing extensive and shallow lagoons, through which the rivers flow to the sea. Shoal water, with depths of less than 3 fathoms, extends a considerable distance off-shore in the northwestern part of this bay; and foul ground, with as little as 3 fathoms water, extends more than 2 miles eastward from the mouth of Kouchibouguac river. As northeasterly gales send a

heavy swell into the bay, it will be dangerous for one to get embayed there, especially at night, or in a dull sailing vessel.

Black Lands gully—Fishing lights.—At Black Lands gully (Big cove), situated 3 miles northwestward of the southern end of Richibucto north beach, two fixed white lights are exhibited from white masts on the north sand beach, 44 yards apart, 293° and 113° , when fishing operations are being carried on. The front light is 29 feet above high water, and should be seen a distance of 10 miles; the rear light is 42 feet above high water and should be seen, in clear weather, a distance of 11 miles. Both lights are visible from all points of approach by water.

The best channel into the gully carries $5\frac{1}{2}$ feet at low water, and is marked by a red cask buoy on the southeastern end of the shoal extending east-southeastward from the north sand beach; the inner edge of this shoal being marked by four red spar buoys. Opposite the red cask buoy is a black spar marking the inner edge of the channel, which closely follows the configuration of the south sands. Fishing boats entering the gully keep southward of the red cask buoy, and steer 259° until past the outer red spar, thence the light masts or their lights in line 313° lead up to the gully.

Kouchibouguacsis river has a course of 40 to 50 miles, but above the point reached by the tide becomes rapid, shallow, and consequently unnavigable. On its banks it has saw and grist mills, and settlements of Acadian French. Of its two outlets through the sand bars, the northern, 3 miles northward of Black Lands gully, is suitable only for boats, as the channel through the lagoon leading to it is nearly filled up with sand and weeds.

The river, after entering the lagoon, and running for some distance toward the northern outlet, turns southward, and continues its course within the sand bar to Black Lands gully (Big cove), the southern and main outlet. There are 3 fathoms water just within the sand bars, 1 to 3 fathoms through the lagoon, and 2 to 3 fathoms for several miles up the river. At high water boats can pass through the lagoons and within the sand bars, not only southward to Richibucto, but northward nearly to Marsh river, a total distance of nearly 15 miles.

Kouchibouguac river, after flowing for more than a mile through an extensive lagoon, nearly dry at low water springs, enters the sea by an outlet through sand bars about 3 miles northward of the northern outlet of Kouchibouguacsis river. Its bar of sand frequently shifts during heavy easterly gales, and the channel is at all times narrow and intricate. A depth of 9 feet at high water springs could be carried in over the bar at the time of the survey.

The banks of the river are well settled, and the village of St. Louis, which is connected with Richibucto by railway, is situated on its right bank about 7 miles northwestward of Richibucto.

Tides.—It was high water, full and change, in July, at about 4 a. m., but the diurnal inequality of the two interfering tides caused the p. m. tide nearly to disappear. The tides rise $2\frac{1}{2}$ to 4 feet, flowing about 8 miles up the river, and affording a depth of 2 to 3 fathoms through a very narrow and crooked channel, for a distance of 5 miles in from the bar.

Sapin ledge, of sandstone and with 12 feet least water, is $1\frac{1}{4}$ miles long, east-northeast and west-southwest, and about $\frac{1}{2}$ mile wide, between the depths of 3 fathoms. Its eastern end bears 98° , $2\frac{1}{2}$ miles from point Sapin and 164° , 6 miles from Escuminac Point lighthouse. There is a depth of $3\frac{1}{2}$ fathoms between the ledge and Sapin point, and the 5-fathom curve of soundings is distant only about 400 yards from the ledge, which should not be approached nearer than the depth of 9 fathoms.

Settlement—Fishing light.—A lantern on a white pole, 34 feet high, with a white shed at its base, 50 feet within the edge of the cliff which forms the shore at the settlement of point Sapin, exhibits, at 50 feet above high water, a fixed white light, that should be seen seawards in clear weather a distance of 12 miles. The light is exhibited only when fishing operations are being conducted in the vicinity.

The pole carrying the light is situated between Messrs. Loggie's lobster factory and the Roman Catholic church, or about midway between point Sapin and Mushroul point. The church, which is conspicuous, is on the point next northeastward of Mushroul point, and Loggie's factory is on the point between the church and point Sapin.

Fishing boats can run for the light when bearing between 248° and 338° . The former bearing clears the southern end of Sapin ledge; the latter bearing clears a reef about 300 yards southward of the light. Within this arc of 90° , boats, when distant 100 yards from the shore, can run southwestward under the reef to good anchorage in 8 to 12 feet water.

The coast, which from point Sapin trends northward for $4\frac{1}{2}$ miles to Escuminac river and thence northeastward $1\frac{1}{2}$ miles to Escuminac point, is low and shallow.

Escuminac point. (See p. 245.)

CHAPTER V.

NORTHUMBERLAND STRAIT, NORTH AND EAST SHORES— PRINCE EDWARD ISLAND.

VARIATION IN 1908.

Cape Bear-----	23° 30' W.	North point-----	24° 00' W.
West point-----	23° 10' W.	East point-----	24° 20' W.

GENERAL DESCRIPTION PRINCE EDWARD ISLAND.

Prince Edward island, the southern and western coasts of which form the northern and eastern shores of Northumberland strait, is rendered very irregular by large bays, inlets, and rivers, which penetrate the island so that, although its greatest length is 102 miles, and the breadth of its eastern part 30 miles, still no part of the island is distant more than 7 or 8 miles from navigable water. The shape of the island is that of an irregular crescent, concave toward the gulf, the northern coast forming a great bay, 91 miles long and 22 miles deep, out of which the set of the tides and the heavy sea render it very difficult to extricate a ship when caught in the northeasterly gales. These gales frequently occur toward the fall of the year, occasionally blowing with great strength, when they prove fatal to many vessels.

The island is undulating, its highest part not exceeding 500 feet above the sea; it is in general much lower, especially near the coast, and the alternation of hill and dale with rivulet forms very pleasing scenery. The island is based on permo-carboniferous and triassic rocks affording a red and very fertile soil, much of which is under cultivation. Cliffs of red sandstone prevail on the coasts, except on the northern coast where long ranges of sand hills and sand bars have been thrown up by the sea.

Prince Edward island is a province of the Dominion of Canada, but has a provincial government for administering local affairs. The area of the island is 2,133 square miles, and its population, in 1901, was 103,258.

Charlottetown, the capital, had, in 1901, a population of 12,080; the other principal towns are Georgetown, Summerside, and Souris.

Products and trade.—The inhabitants, except on the northern coast, where they devote a great deal of attention to the fisheries, are

almost exclusively engaged in agriculture and the breeding of horses and sheep.

The exports of the island consist principally of agricultural produce, small quantities of lumber, and preserved or canned fish and meat.

Climate.—The climate of the island is less severe than that of the neighboring provinces; not quite so cold in winter nor so hot in summer, being tempered by the sea breezes. On the other hand the advance of spring is checked by the northerly winds which drive ice down from the gulf, so that Northumberland strait is sometimes filled with ice as late as the middle of May, and not only is the outbreak of vegetable life frequently retarded until June is well advanced, but also there is seldom any settled warm weather before July.

Fogs.—What was said about fogs in Northumberland strait applies here.

PRINCE EDWARD ISLAND, SOUTH COAST—NORTHUMBERLAND STRAIT, NORTH SHORE.

Cape Bear, the eastern point of the southern coast of Prince Edward island, has a large rock, 12 feet high, close under its cliffs of red sandstone.

Light.—A square white lighthouse, 46 feet high, with a dwelling attached, on Cape Bear headland, exhibits at 74 feet above high water a revolving red light, which attains its greatest brilliancy every 30 seconds, and should be seen in clear weather a distance of 12 miles.

Wireless telegraph.—There is a wireless station at Cape Bear lighthouse whose call letter is BE; but it is in operation only during the winter months for communication with steamers crossing from Prince Edward island to the mainland and is not available for commercial purposes.

Tides.—It is high water, full and change, at Cape Bear at 9h. 0m.; springs rise 6 feet, neaps 3 feet.

Bear reef.—(See page 218.)

Fisherman's bank.—(See page 218.)

The coast of the island to the westward of cape Bear to White sands is formed of sandstone cliffs, which are in some places 40 feet high, without beach or landing, except at Guernsey cove, and from which shallow water does not extend beyond 700 yards.

Black Rock point, 1,200 yards westward of cape Bear, has a rock 7 feet high close off it.

Guernsey point, the western point of Guernsey cove, $1\frac{1}{2}$ miles westward of Black rock, also has a rock above water close off it.

White Sands settlement, named from the sandy beach of a small bay, is about $1\frac{1}{2}$ miles westward of Guernsey point. At the settlement is a sand spit, which is just covered at low water, and affords some shelter to boats, and there is also a sandy shoal extending $\frac{1}{2}$ mile offshore. The edge of this shoal is so steep, and the water near it so deep, that the lead gives no warning.

Clearing mark.—Black Rock point (the extreme to the eastward) open southward of Guernsey point leads southward of the shoal.

The coast from White sands to Little sands, 264° 6 miles, is composed of sandstone cliffs 40 to 50 feet high, and quite bold.

Wood island, about 262° , 3 miles from Little sands, was two small islands, partly covered with wood, but now connected together by sand bars. It is about 1,400 yards long, parallel to the shore, from which it is distant $\frac{1}{2}$ mile, and its eastern part is about 50 feet high: it presents sandstone cliffs to seaward, and its western end is connected to the main island by a long sand bar.

A sand spit extends from the main coast to within 300 feet of the eastern part of the island.

The space between the island, the connecting beaches and the shore, forms a shallow boat harbor having an area of about 300 acres, with its entrance to the eastward, but it is nearly all dry at low water. A shipping place has been constructed here, with two breakwaters, the southern 950 feet long, and the northern 2,500 feet.

Shallow water of less than 5 fathoms extends nearly a mile southward from the island.

Light.—A square white lighthouse, 40 feet high, with a dwelling attached, on the southern side of the eastern part of Wood island, exhibits at 80 feet above high water a fixed white light, which should be seen, in clear weather, a distance of 15 miles.

Range lights.—A square white lighthouse, 19 feet high, 50 feet from the outer end of the southern breakwater, exhibits at 18 feet above high water a fixed red light, visible, in clear weather, from all directions seaward a distance of 6 miles.

A square white lighthouse, 33 feet high, on the beach 252° , 233 yards from the preceding lighthouse, exhibits at 33 feet above high water a fixed red light, that is visible, in clear weather, on the range line, a distance of 7 miles.

These two lights in line 252° , lead in to the inner face of the south breakwater, and the entrance to the boat harbor.

Beacon.—A white beacon, consisting of a diamond shaped top-mark on a spar, stands on the western end of Wood island, 833 yards 269° from the main lighthouse.

This beacon, kept in one with Wood Island main lighthouse, leads through the inside passage between Indian rocks and Rifleman reef;

on the range the least water is 5 fathoms. Seamen using this passage must be careful to give Wood island a berth of at least $\frac{1}{2}$ mile; but strangers should not attempt the passage without a pilot, because a round sand bank lies just to the northward of the range about half way through; and the range is really for the use of local shipping.

Buoy.—A spar buoy, painted black and white in horizontal bands, is moored in 9 feet of water at 79° , 200 yards from the front range lighthouse. It marks the deepest water in a new channel formed by the extension of the southern breakwater changing the direction of the outgoing stream (1902).

Directions.—In entering the boat harbor, keep the buoy bearing 337° until the range lighthouses are in line, when steer for them and so in to the inner face of the southern breakwater, along which the best water will be found: but no attempt should be made to pass the front lighthouse at low tides. Once alongside the southern breakwater, vessels are safe in ordinary weather. The bottom of the channel is hard sand free from rocks or any other dangers to vessels taking the ground; but local knowledge is necessary.

Anchorage.—There is good anchorage in northwesterly winds off the coast anywhere within 1 mile eastward of Wood island, in 3 to 9 fathoms, Indian rocks breaking the sea.

Bell point, 283° . $3\frac{3}{4}$ miles from Wood Island lighthouse, is a cliff of sandstone 40 feet in height.

Bell Point reef, having a least depth of 6 feet, and the western end of which lies south-southwestward $\frac{3}{4}$ mile from Bell point, extends thence eastward about 1 mile. Shallow water extends southward 1 mile from the point to the 3-fathom curve, which has 9 to 10 fathoms close to its edge, but the shallow water continues westward to Rifleman reef.

Indian rocks, which occupy a space parallel to the coast between Wood island and Bell point, $1\frac{1}{2}$ miles in length, and $\frac{1}{2}$ mile in breadth, between depths of 3 fathoms, are of sandstone, dry to a considerable extent at low water, and their southern edge is $1\frac{1}{2}$ miles offshore. There is deep water close southward of these rocks, but there are almost always breakers or a rippling on the part which dries.

Caution.—In standing toward the rocks at night, if Wood Island light is not visible, observe that there are 10 fathoms within $\frac{1}{4}$ mile of their southern edge; that 13 fathoms is near enough to approach their southeastern end, and 10 fathoms their southwestern end; do not get between the latter and Bell Point reef, where there are also 10 fathoms.

Leading marks.—The southeastern point of Wood island bearing northward of 45° , leads southeastward of their southeastern

end; Macdougall and Pinette points in line, bearing 321° , leads westward of their western end: but Pinette point, the southern entrance point of Pinette harbor, can not always be distinguished.

The channel between Indian rocks and the land is over $\frac{1}{2}$ mile wide, with depths of 4 to 9 fathoms water, but as the soundings are irregular, with rock or gravel bottom, and the tidal streams are strong, it should not be used for navigation except by small craft with local knowledge. (See paragraph above under **Beacon**.)

Buoys.—The north side of this channel is marked by a red spar buoy in $3\frac{3}{4}$ fathoms off the southwestern end of Wood island, and a red spar buoy in 13 feet water off Kenneth bank.

An automatic whistling buoy is moored in 10 fathoms southwestward of Indian rocks, with Wood Island lighthouse bearing 54° , distant $4\frac{1}{4}$ miles. The whistle may not sound when the sea is smooth.

Tides and tidal streams.—It is high water, full and change, at Indian rocks at 9h. 45m. nearly: springs rise 6 feet, neaps 4 feet. The tidal streams in the deep water close outside Indian rocks frequently run at the rate of 3 knots an hour.

Rifleman reef, of sandstone, extends 2 miles westward from Stewart point, which bears 287° , 1.1 miles from Bell point; and from the outer point of the reef, in 3 fathoms, Prim point bears 309° 8 miles. Just within the outer point of the reef there are 8 feet water, and halfway between it and the shore only 5 feet, while there are depths of 12 feet at low water between other shallow patches on the reef.

Buoy.—A red conical buoy, with “Rifleman reef” on it in white letters, is moored in 15 fathoms water off the southwestern point of Rifleman reef, with Prim Point lighthouse bearing 314° , distant 8 miles.

Caution.—The very irregular soundings off Rifleman reef, and the deep water close to it (there being a depth of 16 fathoms within less than $\frac{1}{2}$ mile, while there is a much less depth farther out), render caution necessary when navigating in its vicinity. The position can then be obtained by bearings of Wood Island and Prim Point lighthouses or lights, and sometimes by the whistling buoy off Indian rocks. There are no leading marks to clear its western end, which has 7 fathoms close-to, but the soundings give better warning there than farther southward. The wooded point, within and opposite Wood island, in line with Black point, the extreme to the eastward, bearing 90° , just clears the southern side of the reef; but the safest plan, when approaching it from the southward, is not to close the reef nearer than the extreme of the land to the eastward in line with the northern side of Wood island, bearing 82° , which line leads $1\frac{1}{4}$ miles

from the reef. If Prim Point light is visible it should not be brought to bear to the westward of 315° .

If the lights are obscured, close attention must be given to the soundings. When standing across from the southward toward the reef, the soundings, after being 11 to 9 fathoms for some 4 miles, suddenly increase to 14 to 16 fathoms; this deep water is less than a mile from the reef, and the depth of 10 fathoms on its northern side is only 600 yards from the reef.

Directions for Wood Island channel.—Approaching from the westward, first make Rifleman Reef buoy, leave it on the port hand, and then steer 90° direct for Wood Island main lighthouse until 4 fathoms is struck at 270° from the light; then steer for the red spar buoy off Wood island, and leave it 200 yards on the port hand. These courses will lead inside Indian rocks in not less than 4 fathoms.

Flat river, which is suitable only for boats, is $2\frac{1}{2}$ miles northwestward of Stewart point. Shallow water runs 1 mile off Macdougall point, which is the southeastern entrance point of the river.

Pinette harbor, $3\frac{1}{2}$ miles northwestward of Flat river, has only 2 feet at low water over its rocky and dangerous bar, which is nearly 1 mile outside the entrance to the harbor. It is therefore suitable only for small craft, although it has 3 to $4\frac{1}{2}$ fathoms in its narrow channel, which runs in 2 to 3 miles through flats of mud and weeds, dry at low water, and then divides into several shallow branches.

Pinette shoals.—The outer point of these shoals, in 3 fathoms, lies southwestward 2 miles from Pinette point; there are 9 feet water just within their outer point, and 3 feet at no great distance, the bottom being rock. These shoals should not be approached nearer than the low water depth of 6 fathoms.

Tides.—It is high water, full and change, at Pinette at 10h. 0m.; springs rise 8 feet, neaps 5 feet.

Hillsborough bay, containing the principal harbor and the capital town, and being the outlet of an extensive inland navigation, is the most important, as well as the largest, bay in Prince Edward island. Its entrance lies between Prim point and St. Peters island, the island bearing 300° , $7\frac{1}{2}$ miles from the point.

Prim point, the southeastern point of Hillsborough bay, is low, with sandstone cliffs 10 to 15 feet high. Prim island, distant $1\frac{1}{4}$ miles northeastward from the point, also has low cliffs and is united to the northern side of Prim Point peninsula by sand beaches inclosing marshy ponds.

Light.—A circular white lighthouse, 55 feet high, with a dwelling near it, situated 100 yards within Prim point, exhibits, at 68 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 12 miles.

Prim reefs, of sandstone, run westward, both from the island and the point, so as to form a forked reef, with very uneven soundings; its western end, in 3 fathoms, bears 273° , 2 miles from the lighthouse, and the end of the southwestern part 304° , $1\frac{1}{4}$ miles; but shoal water to depths of less than 5 fathoms extends 3 miles from the point.

Buoy.—A red bell buoy, with “Point Prim Reef” in white letters on the deck, is moored off the 3 fathoms end of Prim reef, and lies with Prim Point lighthouse bearing approximately 91° distant 2.2 miles.

Clearing mark.—The Scotch church spire, in line with Blockhouse point 357° , leads in deep water westward of Prim reef.

Orwell bay, leading to Orwell, Vernon, and Seal rivers, is 2 miles wide at its entrance between Gallows and Buchanan points, Buchanan point being on the southern shore at 5 miles east-northeastward of Prim point and Gallows point bearing from Buchanan point 329° , 2 miles. From Prim island eastward the shallow water increases its distance from the shore until it stretches nearly halfway across the mouth of Orwell bay. Its edge, in 3 fathoms northwestward of Buchanan point, is $1\frac{1}{4}$ miles out from the cliffs to the southward, and close southward of this edge is a rock, with 9 feet least water, which bears 281° a little more than 1 mile from Buchanan point. Between these shoals and those which stretch southward from Gallows point the channel is 800 yards wide and carries nearly 5 fathoms water, becoming shallower and narrower within the bay, until off MacInnis point, $1\frac{1}{2}$ miles within the entrance and on the northern shore, it suddenly contracts to less than 200 yards in breadth, and decreases in depth to 14 feet at low water springs. This is the bar, and the channel becomes only a little wider within, the depth increasing to 7 fathoms between steep shoals on either side.

Just within China point, on the northern shore, and 2 miles within the bar, is the confluence of Orwell and Vernon rivers, and there vessels may lie land locked, the channel being 170 yards wide and carrying 5 fathoms water between mud flats dry at low tide. China point pier, on the eastern side of China point, extends into a depth of 14 feet at low water. Vessels ascend more than a mile up Orwell and Vernon rivers, but both rivers are obstructed with oyster beds at $1\frac{1}{4}$ miles from China point, and their channels higher up become very shallow and narrow, Orwell river being quite dry at low water, as is also Seal river, which enters Vernon river from the northward.

Belfast pier extends 600 feet from the southern shore of the bay about 1 mile from Eldon village into a depth of 4 feet at low water.

Douse Point range lights.—A square white lighthouse, with sloping sides, 16 feet high, on Douse point, the point northward of Muttock point, exhibits, at 16 feet above high water, a fixed red light,

which should be seen, in clear weather, when in alignment with the following light, a distance of 6 miles.

A similar lighthouse, 22 feet high, situated 38° . 436 yards from the preceding lighthouse, exhibits, at 28 feet above high water, a fixed red light, which should be seen, in clear weather, when in alignment with the preceding light, a distance of 6 miles.

These lights in line 38° lead from mid-channel between MacInnis and Belfast points, across the bar and nearly up to the black beacon off China point.

Brush Wharf range lights.—A square white lighthouse, 15 feet high, on the western side of Brush wharf, exhibits, at 18 feet above high water, a fixed green light, which should be seen, in clear weather, when in alignment with the following light, a distance of 2 miles.

A similar lighthouse, on the left bank of Orwell river 75° , 158 yards from the preceding light, exhibits, at 27 feet above high water, a fixed green light, which should be seen, in clear weather, when in alignment with the preceding light, a distance of 2 miles.

These lights in line 75° lead from the red beacon on Douse point to Brush wharf.

Beacons.—A black beacon marks the edge of the bank off China point; and a red beacon marks the edge of the shoal off Douse point, at the junction of Orwell and Vernon rivers.

Buoys.—Three black cask buoys are moored in the channel on the range line of Douse Point lights; the first is nearly midway between Belfast and MacInnis points, the other two are about 1,400 yards and 2,600 yards, respectively, nearer Douse point.

Directions.—To enter Orwell bay and Orwell river, after rounding Prim Reef bell-buoy, bring Prim Point lighthouse to bear 127° distant 2.4 miles, and the west tangent of Governor island to bear 9° , then steer between the shoals, 70° , keeping the lead going, and bring Douse Point Range lighthouses in line, 38° , between Belfast and MacInnis points, where mid-channel is marked by a cask buoy. Keep this range on until the black beacon and the clump of spruce bushes on China point are abeam on the port hand. Then steer 354° until the red beacon on Douse point has been passed on the starboard hand, and Brush wharf range lighthouses are in line, 75° , then steer on that range to the wharf.

Brush wharf, or Port Selkirk wharf, which is situated on the southeastern side of Orwell river near its entrance into Orwell bay, is 250 feet long and has a depth of about 8 feet at its outer end at low water.

Gallows point, at the end of a peninsula separating Pownell and Orwell bays, has off it a long reef of sandstone and extensive shoals, on which are scattered rocks covered with only a few feet water.

These shoals extend 2 miles toward Governor island, and also a little more than 1 mile toward Prim point. There is, moreover, a detached shoal, with 13 feet least water, bearing 254° , 2 miles from Gallows point.

Pownell bay, which is shallow and open to westerly winds, affords shelter to small craft and boats near its head, which dries extensively at low water. A pier, 753 feet in length, runs out from the shore of this bay, and a channel, 50 feet wide, has been dredged to a depth of 6 feet at low water from the deeper water in and through the bay to its head.

Caution.—The eastern part of Hillsborough bay is but little frequented by shipping; it abounds with shoals, and the services of a pilot are indispensable for its navigation.

Anchorage.—Northeastward of Governor island, under shelter of the shoal at its eastern point, and off the mouth of the shallow Squaw bay, which lies westward of Pownell peninsula, there is good anchorage for small vessels in 9 to 12 feet, mud bottom.

Governor island, in Hillsborough bay 352° , nearly 5 miles from Prim point, is low, in great part wooded, based upon sandstone and has shoals around it on all sides.

Governor shoals, of sandstone, extend southwestward and westward from the western end of the island. The reef dries at low water for $\frac{1}{2}$ mile westward, and has depths of less than 3 fathoms, with uneven bottom, for 2 miles from the island. Huntley and Fitzroy rocks are also on these shoals.

Huntley rock, on the southwestern part of Governor shoals and situated 1.7 miles south-southwestward of the southern end of Governor island, has 12 feet water over it at low tide; other patches, with 17 to 22 feet water, extend out $2\frac{1}{2}$ miles, and the south-southwestern end of Governor shoals in 5 fathoms is distant $3\frac{1}{2}$ miles from the island.

Fitzroy rock, with 20 feet least water, lies 239° , 1.8 miles from the northwestern end of Governor island, and approximately with the northwestern point of that island in line with Pownell point.

Light and whistling buoy.—A red whistling buoy, showing an intermittent white light, is moored 350 yards south-southwestward of the shoalest part of Fitzroy rock.

Clearing mark.—The Scotch church spire at Charlottetown open of Battery point, bearing 353° , clears the western side of Governor shoals, and just clears well the western end of the shoal water around Fitzroy rock.

Shallow water continues on the eastern side of the channel into Charlottetown harbor, northward of Governor island, to Sea Trout

point at the entrance of the harbor, there being only a passage for boats or small craft between Governor island and the land northeastward of it.

Eastern bank.—The edge of the bank, in 5 fathoms, runs north-northwestward from abreast Spithead buoy to Sea Trout point; consequently parallel, in this part, to the bank on the opposite side, leaving a channel with 7 to 12 fathoms water, and 600 yards wide between depths of 5 fathoms, or $\frac{1}{2}$ mile wide between depths of 3 fathoms.

Squaw shoal, with 10 feet least water, approaches close to the edge of the bank, where it is steepest.

Leading mark.—Battery and Sea Trout points in line, bearing 337° , leads along the edge of the bank, in $4\frac{1}{2}$ fathoms least water, from abreast Spithead buoy on the western side to near Sea Trout point. Small vessels bring this range on when the northern point of Governor island and Gallows point are touching, southward of which range it leads over the reef off the western end of the island. Large vessels had better not bring it on until at its intersection with the Haszard Point range lights.

Haszard Point range lights.—A square white lighthouse, 47 feet high, with a brown lantern on Haszard point, at about 1.8 miles eastward of Charlottetown harbor entrance, exhibits, at 45 feet above high water, a fixed white light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line, a distance of 12 miles.

A similar lighthouse, situated 20° , 748 yards from the preceding lighthouse and in rear of Bellevue farm buildings, exhibits, at 125 feet above high water, a fixed white light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line, a distance of 17 miles. These lights in line lead through Hillsborough bay, clear of all dangers to the intersection of their range line with that of the Brighton Beach range lights.

St. Peters island, lying off the western point of entrance to Hillsborough bay, is rather more than 3 miles around, and of very moderate height, having cliffs of red clay and sandstone, 35 feet high, along its eastern shore. There are several farms on either side, but the central parts of the island are thickly wooded. It is joined to Rice point, the western point of the bay, from which it is distant $1\frac{1}{4}$ miles, by sands dry at low water.

Light.—A square white lighthouse, 38 feet high, on the southern side of St. Peters island, exhibits, at 70 feet above high water, an intermittent white light every 36 seconds, thus: Light, 30 seconds; eclipse, 6 seconds; which should be seen from 240° through west, north, and east to 123° , where obscured by the high land of St. Peters island, in clear weather, a distance of 14 miles.

St. Peters shoals.—Shallow water extends $1\frac{1}{4}$ miles southwestward and southward from St. Peters island. Farther eastward St. Peters shoals are much more extensive, stretching out northeastward $3\frac{1}{4}$ miles from the northeastern point of the island; and the bottom is very uneven along the outer edge of all these shoals. St. Peters spit, of sand, dries out for 2 miles northeastward of the island, and affords shelter to St. Peters road, northward of it, which is suitable only for small vessels, having 9 to 12 feet at low water.

Buoy.—A black can buoy marked “St. Peters island SW. reef,” is moored in $4\frac{1}{4}$ fathoms water on the shoal extending southwestward from St. Peters island, with the western point of that island bearing 36° , distant $1\frac{1}{2}$ miles.

Spithead, a rocky shoal, with 8 feet least water, lies eastward of St. Peters spit, and extends to within $\frac{1}{4}$ mile of the eastern end of St. Peters shoals.

Buoy.—A black can buoy is moored in 5 fathoms on the eastern end of St. Peters shoals, 790 yards eastward of Spithead.

Western bank.—The 5 fathoms edge of the bank forming the western side of the channel into Charlottetown harbor, trends north-northwestward 2.4 miles from Spithead buoy to about 200 yards off Blockhouse point, at the entrance of the harbor. The edge of St. Peters shoals may be followed by the lead in 5 fathoms as far in as Spithead buoy, after which the bank becomes steep, and must be approached with caution in a large vessel.

Trout rock, with 7 feet least water, lies 400 yards within the edge of the bank, and 175° , 1,200 yards from Blockhouse point, which, in line with Government house, bearing 353° , leads eastward of the rock in about 14 feet water.

Charlottetown harbor entrance, between Sea Trout and Blockhouse points, is 900 yards wide, but shallow water extending from both shores reduces the navigable width of the channel, which has a depth of 7 to 13 fathoms between the shoals, to about 450 yards, and the shoals on each side are very steep. The land on both sides is formed of red sandstone cliffs, from 10 to 30 feet high, whence it rises gradually in undulations, being partly cultivated and partly wooded.

Battery point is nearly 1 mile north-northwestward of Sea Trout point; a shoal extends 400 yards southwestward from it.

Buoy.—A red conical buoy is moored in 3 fathoms on the outer end of the shoal extending from Battery point.

Leading mark.—The belfry of St. Dunstan Roman Catholic College in line with the flagstaff at Government house leads 120 yards westward of the shoal off Battery point in 10 fathoms.

Blockhouse point is the western entrance point, and the next point of cliff to the northward is Alchorn point, 500 yards west-

northwestward of which, on the hill, 93 feet above high water, are the remains of Amherst fort, now showing as a conspicuous clump of trees. On the same side, northward of Alchorn point, is Warren cove, and, at a distance of $1\frac{1}{4}$ miles from the lighthouse, Canseau point. A ferry pier extends about 100 yards off Blockhouse point, and its end dries at low water.

Light.—A square white lighthouse, 42 feet high, with a dwelling attached, on Blockhouse point, exhibits, at 56 feet above high water, a fixed white light, which should be seen in clear weather a distance of 12 miles.

Canseau spit extends 700 yards off Canseau point; Blockhouse lighthouse just open clear of Alchorn point leads eastward of it; observing that the ends of the cliffs of Blockhouse and Alchorn points in line lead over the point of the shoal in 16 feet at low water. The Brighton Beach range lights in line lead to the eastward of the spit in 19 feet at low water.

Buoy.—A black can buoy is moored on the eastern end of Canseau spit.

The harbor.—Immediately within Battery and Canseau points, the inner entrance points, the channel expands into the harbor, which is large and deep. York river flows into it from the north-northwestward, Hillsborough river from the northeastward, and Elliot river from the west-southwestward. The confluence of the streams of these three rivers, between Canseau spit and the mouth of York river, forms the Three Tides, where there is excellent anchorage; but the usual anchorage is off the wharves of the town, where the channel is 550 yards wide, and carries 7 to 10 fathoms water.

Hillsborough river is navigable for vessels of any draft for 7 miles, and for small vessels for 14 miles, above Charlottetown, where there is a bridge 2 miles from the head of the river. There is a portage of less than 1 mile across from the Hillsborough near its head to Savage harbor on the north coast of Prince Edward Island.

A railway drawbridge, resting on 11 piers, crosses the river $\frac{1}{2}$ mile above Ferry point, the ends of the bridge being connected with the shore by embankments from high water line to low water line.

A telephone cable is laid across the river parallel to and about 200 yards below the bridge.

York river, the channel of which is narrow, is crossed by Poplar island bridge $2\frac{3}{4}$ miles from its mouth.

Elliot river is navigable for 4 miles by large vessels and for 9 miles by small craft.

The shores of all three rivers are settled, and the country is generally fertile.

Flats.—Within Charlottetown harbor flats of mud and weeds extend about 700 yards offshore.

Buoys.—A black cask buoy is moored off Duchess point at 183° 1,150 yards from Governor's house flagstaff. This buoy is withdrawn in the winter.

The edge of the bank to the northeastward of Battery point is marked by the following buoys:

A red conical buoy, marked No. 1, in 32 feet of water 347° , 1,000 yards from Battery point.

A red spar buoy surmounted by a triangle situated 271° , 800 yards from Rosebank point.

A red conical buoy in 24 feet of water 322° , 700 yards from Rosebank point.

A red spar buoy in 30 feet of water 339° , 150 yards from the northeastern end of Ferry Point jetty.

Middle ground, a patch with a least depth of 17 feet, is situated on the northern side of the harbor fairway 36° , nearly 1 mile from Canseau point. A black and red horizontally striped can buoy is moored 274° , 1,200 yards from Rosebank point on the southern edge of this shoal.

Clearing mark.—The lunatic asylum, a conspicuous red brick building, with a tower, 600 yards westward of Falcon point, which is on the right bank of Hillsborough river 2 miles above Charlottetown, just open southeastward of the end of the railway wharf at Charlottetown, bearing 36° , leads southeastward of Middle ground.

Brighton Beach range lights.—A white skeleton tower, with a red diamond on its southern side and a red lantern, 40 feet high, on Brighton beach, on the eastern shore of York river, exhibits, at 41 feet above high water, a fixed red light, which should be seen in clear weather, on, and over a small arc on each side of, the range line, a distance of 7 miles.

A white square tower, with a red diamond on its southern side and a red lantern, 45 feet high, situated 237° , 425 yards from the preceding light, exhibits, at 72 feet above high water, a fixed red light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line, a distance of 9 miles.

These lights are exhibited during the season of navigation, and whenever the winter steamer is running to Charlottetown; and in line 237° they lead from the intersection of their range line with that of Haszard Point range lights, to the intersection of their range line with that of the following range lights:

Warren Farm range lights.—A white square tower, with a white square lantern, and 30 feet high, situated on the Warren farm, on summit of cliff, 220 yards, 324° from northeast angle of old

Amherst fort, exhibits, at 39 feet above high water, a fixed red light, that should be seen, in clear weather, and on the range line, a distance of 2 miles.

A similar tower, situated 381 yards, 197° from the preceding tower, exhibits, at 57 feet above high water, a fixed red light, that should be seen on the range line, in clear weather, a distance of 2 miles.

These lights in line 197° lead from the intersection of their range line with that of the Brighton Beach range lights to the wharves at Charlottetown. This, of course, is a back range.

Tides and tidal streams.—It is high water, full and change, in Charlottetown harbor at 10h. 45m.; springs rise $9\frac{1}{2}$ feet, neaps 8 feet. The rise is considerably influenced by the wind, and during north-easterly gales the water has risen 11 feet at springs, and during south-westerly gales only 6 feet at neaps; these cases, however, are unusual. The range of neaps is sometimes less than 3 feet. The duration of the two tides is nearly equal, and the streams continue about $\frac{1}{4}$ hour after high and low water on the shore, running usually at the rate of $1\frac{3}{4}$ knots off the town, and $2\frac{1}{2}$ knots in the entrance of the harbor.

There is considerable diurnal inequality in height of the tides which, however, principally affects low water level, consecutive high waters varying from 3 to 15 inches, and low waters from 3 inches to $3\frac{1}{2}$ feet. One tide of the day may have a range of 7 feet and the other of only 3 feet.

The rise of tide at Charlottetown is the greatest in the gulf below cape Chat, excepting at Campbellton.

Tide tables for Charlottetown are published by the department of marine and fisheries of the Dominion of Canada, and by the United States Coast and Geodetic Survey.

NOTE.—The observations on the tides were continued in Charlottetown harbor hourly through 11 semilunations, with an accurate tide gauge, with the following results:

The corrected establishment was 10h. 18m. The a. m. tide, however, was 10h. 24m., and the p. m. tide 11h. 7m., after the moon's transit, the mean being 10h. 45m. The mean duration of the flood (by 294 observations) was 6h. 14m., and of the ebb 6h. 11m., the flood being rather the longer. The diurnal inequality in the heights of the alternate flood tides is here only slightly shown, but it may be plainly observed in the ebb tides, or in the difference of the levels to which the alternate tides descend.

It is high water, full and change, at the head of Hillsborough river at 11h. 0m.; springs rise 10 feet, neaps $8\frac{1}{2}$ feet.

Ice.—Charlottetown harbor is usually frozen over about December 21, and is clear of ice about April 7, being completely closed between those dates. The harbor has been clear of ice on April 1, and it has remained open until December 27.

The first vessel arrives from sea about April 26, and the last vessel leaves about December 20.

Pilots.—There are no licensed pilots at Charlottetown.

Caution—Buoys.—The buoys in Hillsborough bay and Charlottetown harbor are frequently out of position, therefore the range marks and the lead should be used.

Directions.—From the eastward steer for a position 257° , 5 miles from Prim Point lighthouse. and then bring the lighthouses on Haszard point, or their lights, in line. 20° . Keep this range and steer in a depth of not less than 5 fathoms westward of Fitzroy Rock bell-buoy and toward the harbor channel, until Brighton Beach lighthouses, or their lights, are in line bearing 337° , guarding against the flood tidal stream which sets strongly into Orwell bay and over Governor shoals. Then steer through the harbor channel with the Brighton Beach range on until past Canseau spit, and the lunatic asylum is just open south-eastward of the railway wharf 33° ; then keep this range on and steer in the fairway southeastward of Middle ground to the anchorage off the ferry pier on the town side. This is the best anchorage. and in the fall of the year it is advisable to moor with the anchors northeast and southwest.

After having picked up the Brighton Beach range, the back range of Warren farm may be used thus: Steer as above, with the Brighton Beach range on until the Warren Farm range lights are in line; then steer up the harbor with that range on, until the lunatic asylum and railway wharf range is picked up. If bound to the anchorage, follow this last range as above. If going alongside the wharf. follow the Warren Farm range to the wharves.

The Warren Farm range is much better for a heavy-draft vessel from its intersection with the Brighton Beach range, because the latter, if followed to its intersection with the lunatic asylum range, leads across the shoal water off Canseau spit through the low-water depth of 19 feet.

In clear weather and when the below-mentioned range marks are visible, when southwestward of Prim reef, bring the thin spire of the Scotch church in line with Blockhouse point, bearing 357° , and follow this range until Haszard Point lighthouses are in line.

As Haszard Point lighthouses in line leads rather close to Fitzroy rock, in a vessel of heavy draft edge to the northwestward while passing it; in such vessels also do not overshoot the line of Brighton Beach lighthouses, and in approaching Canseau spit keep Blockhouse Point lighthouse just open clear of Alchorn point till the harbor range comes on. If the Warren Farm range is used this last precaution is not necessary.

In thick weather, from a position about $1\frac{1}{2}$ miles westward of the red buoy on the western end of Prim reef, and in not less than the low-

water depth of 10 fathoms, steer 337° across the bay and strike soundings of 5 fathoms on the southern edge of the bank off St. Peters island; then follow the 5-fathom curve to the northeastward until about 1 mile above Fitzroy rock, and then anchor.

From the westward bring the northwestern point of Governor island and Pownell point in line, bearing 59° , and keep this range on until the thin spire of the Scotch church is in line with Blockhouse point, bearing 337° , when steer 33° , allowing for the flood or ebb stream, as the case may be, until Haszard Point lighthouses are in line, when proceed as before directed.

If the range marks can not be made out, follow the southern and eastern edge of St. Peters shoals in 5 fathoms up to Spithead buoy, and then proceed as before directed. If the weather is too thick to see the range lighthouses, anchor when 1 mile above Fitzroy Rock bell-buoy, as above directed, from the eastward.

Caution is necessary when navigating from the buoy on the southwestern shoals of St. Peters island to Fitzroy Rock bell-buoy, especially during the flood or northwest-going stream, and when sounding remember the uneven bottom.

When beating in make short boards off and on the edge of St. Peters shoals until more than 1 mile above Fitzroy rock; after which, in standing westward, tack when the western side of Government house is in line with Battery point, 344° , until well within Spithead buoy; in standing eastward, tack when Battery and Sea Trout points are in line, 337° , until close off the entrance of the harbor.

Caution.—A vessel of heavy draft could not safely beat in or out through the entrance without more buoys; and even in small vessels local knowledge is necessary, and the flawy and unsteady wind, which so commonly prevails there, must be guarded against.

Charlottetown, the capital of Prince Edward island, is advantageously situated on the right bank of Hillsborough river, $2\frac{1}{2}$ miles inside the harbor entrance, where deep water approaches nearest the shore. The city, which is laid out with spacious squares and wide streets at right angles to each other, contains eight churches, three banks, and numerous factories, and is well supplied with gas, electric light, and splendid waterworks; it has also three daily and six weekly newspapers.

The provincial building, which occupies the middle of the public square, is flanked by the law courts and post-office, both of which are brick structures. The Market house, a large building of red sandstone, is situated westward of the post-office, while St. Paul's church, also of red stone, with a spire, occupies, with the school, the eastern end of the square. The Presbyterian church, a handsome stone building with a tall spire, is situated at the northwestern end of the

town. A convent, built of brick with a small belfry at the top, is somewhat conspicuous from the harbor, but the Roman Catholic cathedral, a large stone building with two spires, is the most conspicuous object from the harbor. Westward of the town, behind a large green lawn, stands Government house, nearly hidden by trees, but which may be distinguished by its colonnade and isolated position. Eastward, between it and the Presbyterian church, is one of the public schools, a large building of red brick, with a flagstaff. Victoria park, protected along the sea front by a wooden breastwork, is a large open space westward of Government house. The railway station is at the eastern end of the town, and may be known by the wharf in connection with it, on which stand large chocolate-colored warehouses. St. Dunstan college, a Roman Catholic seminary, stands on a hill 150 feet high, $1\frac{1}{2}$ miles northward of the town.

In 1901 the population of the city was 12,080.

No part of the city exceeds 50 feet above high water, but behind it, at the distance of $1\frac{1}{2}$ miles, the land rises gradually to the height of 150 feet, and is well cultivated.

Wharves.—There are several wharves of 300 to 500 feet in length, with an average depth of 15 feet water at their outer ends, where vessels lie.

Storm signals are exhibited at Charlottetown.

Tugs.—There are four tugs at Charlottetown.

Coal.—About 13,500 tons of Pictou and Cape Breton coal are usually kept in stock, under sheds. Vessels coal alongside the wharves, or the coal can be taken off in a lighter, which contains 200 tons; a tug can be hired if required. Five hundred tons can be put on board in bags or baskets in an ordinary day's work, and 700 tons by working day and night. The weather does not interfere with coaling.

Supplies.—Meat, vegetables, and bread are plentiful and good; and all kinds of other supplies may be obtained at Charlottetown. Good water in large quantities comes from standpipes on wharf, or from boats fitted as tanks.

Repairs.—Small repairs can be made to machinery and boilers.

There is an iron foundry, but heavy castings are obtained from New Glasgow.

Communication.—The Prince Edward Island railway runs into Charlottetown.

During the season of navigation a steamer runs to Pictou five days each week; a steamer running to and from Montreal and Pictou calls fortnightly each way, and steamers of the Plant line run between Charlottetown and Boston twice a week each way, calling at Port Hawkesbury and Halifax.

Telegraph.—There is telegraphic communication with the telegraph system of Prince Edward island and with those of Canada and the United States.

Trade.—The exports are principally butter, cheese, potatoes, and other farm produce.

Hospital.—Sick seamen are cared for in Charlottetown hospital.

Quarantine.—Charlottetown is a minor quarantine station.

The United States is represented by a consul and by a vice and deputy consul.

The coast from St. Peters island to Marle head, a distance of 9 miles west-northwestward, is straight and unbroken, and may be approached by the lead to 5 fathoms water if one bears in mind that that depth is occasionally within 400 yards of shallow water, which extends in some places $\frac{3}{4}$ mile offshore.

Canoe cove, about 5 miles westward of St. Peters island, is a small indentation in the coast which, being protected by a reef extending from the point on its western side, affords fairly good shelter to boats, with northerly winds. An isolated breakwater is constructed at the entrance of the cove to shelter it from southerly to south-westerly winds.

A reef also runs out nearly a mile from Marle head.

Rice cove, $1\frac{3}{4}$ miles northwestward of Marle head, is nearly dry at low water, and is crossed by a bridge 1 mile from its entrance.

Brockelsby head, 295° , $2\frac{1}{2}$ miles from Marle head, is the eastern point of the bay in which Crapaud road is situated, and is composed of clay cliffs, 15 feet high, based upon sandstone. A sandstone reef extends 1 mile southward from the head.

Inman rock, with 4 feet water over it and 13 to 19 feet around it, lies near the outer part of the reef extending off Brockelsby head, and 157° , 1,200 yards from the head. Large vessels should not approach the rock nearer than the low-water depth of $4\frac{1}{2}$ fathoms.

Crapaud road is a small but secure anchorage off the mouth of Brockelsby river, and between the eastern part of Tryon shoals and the land. The anchorage space, for vessels of medium draft, in 12 to 15 feet at low water, is about $\frac{1}{2}$ mile long and 400 yards wide; but that for small craft, in 7 to 9 feet, is more extensive, continuing nearly 1 mile farther westward in a narrow channel or cove in the sands, which dry at low water. The entrance to this road, between the eastern point of Tryon shoals and the shallow water off the shore to the eastward, was 180 yards wide, and carried 9 feet at low-water spring tides, when it was surveyed, but the eastern end of the shoals is extending.

Channel and basin.—A dredged channel, 50 feet wide, with a depth of $6\frac{1}{2}$ feet in it, extends northward 700 yards, from 600 yards

eastward of Paul bluff, which is nearly $2\frac{1}{2}$ miles 301° from Brockelsby head, to a dredged basin, having a depth of 8 feet, and which is 300 yards in extent.

Victoria.—The village of Victoria, which is on the northern side of this basin, being the outlet of a very fertile and well-tilled district, is the most important place of shipment after Summerside on the southwestern side of the island. It has a pier 486 feet long, with a depth of 9 feet at its end at low water. In summer a steamer plies weekly between Victoria and Charlottetown.

From the village a bridge crosses Brockelsby river to Beacon point.

Brockelsby river dries at low water, excepting a very narrow winding channel through mud flats, by which boats can ascend to the bridge $1\frac{1}{4}$ miles within its entrance. The land eastward of the river rises to the height of 250 feet, and the neighboring country is pleasing and well settled.

Lights—Leard's range.—A square white lighthouse, 38 feet high, with a red diamond on its southern side, on the western end of the bridge at the head of Crapaud basin, exhibits, at 41 feet above high water, a fixed white light, which should be seen in clear weather, from all directions seaward, a distance of 6 miles.

A square, pyramidal, white, open-framed lighthouse, slatted toward the channel, 46 feet high, about $\frac{1}{2}$ mile, 337° from the preceding lighthouse, exhibits, at 95 feet above high water, a fixed white light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line, a distance of 8 miles.

Wright's range.—A lantern on a mast, 11 feet high, rising from a square shed, painted white, and surmounted by a triangular beacon, on the southern side of Paul bluff, exhibits, at 30 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 3 miles over a small arc in the direction of the range line.

A square, white, open-framed tower, slatted on side facing range, with a red lantern, 27 feet high, situated on Wright's farm 295° , 700 yards from Paul Bluff light, exhibits, at 50 feet above high water, a fixed red light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line, a distance of 3 miles.

Wharf range.—A light mast, 18 feet high, on Palmer's wharf, 180° 200 yards from the front Leard's range light, exhibits, at 20 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 2 miles. This light in line with the front Leard's range light, 0° , leads through the dredged channel to the wharves in the basin.

Buoyage.—A red conical buoy is moored in 18 feet water, with Leard's range front lighthouse bearing 341° , distant 1.8 miles.

A black cask buoy is moored in 12 feet water off the eastern end of Tryon shoals.

A black cask buoy, marking the best anchorage in the road, is moored in 12 feet water, off the entrance to the dredged channel.

A black cask buoy is moored on the eastern side of the harbor, with Paul Bluff light bearing 293° , distant 2,400 yards.

A black spar buoy is moored in 12 feet at the southern end of the port side of the dredged channel, in which, on the port edge of the cut, two other black spar buoys are placed at equal distances in 4 feet water. A black stake is driven on the port side of the northern end of the channel.

A red spar buoy is moored in 9 feet water on the starboard side of the northern end of the channel.

Directions.—To enter Crapaud road, bring Leard's range lighthouses into line, 337° , and keep this range on until Wright's range lighthouses are in line, 295° , when steer on that range to the anchorage near the black buoy, in 13 to 15 feet water, sand and mud bottom and good holding ground. No heavy sea comes into this anchorage, the sands outside being covered only to a depth of a few feet at high water, and the shallow water to the eastward, off Inman point and Brockelsby head, overlaps the entrance to the road.

The front lighthouse of Leard's range and the light mast on Palmer's wharf in line, 0° , leads through the dredged channel from the black buoy at the entrance to the wharves in the basin; the black buoys and stake are left on the port hand, and the red stake on the starboard hand, entering. Mariners, except those with local knowledge, should not attempt the dredged channel at night.

Tides.—It is high water, full and change, in Crapaud road, at 10h. 0m.; springs rise 8 feet, neaps 6 feet. The tidal streams are weak and irregular; generally the rate does not exceed $\frac{1}{2}$ knot at the anchorage, but sometimes it reaches $1\frac{1}{2}$ knots for a short time along the edge of the shoals and in the entrance.

Tryon shoals, of sand upon sandstone, dry out 1.3 miles offshore, between Brockelsby and Tryon rivers, and their southwestern end, in 3 fathoms bears 177° , distant 2 miles from Tryon head. At 800 yards north-northeastward from the southwestern end of the shoals there are only 2 feet water over rocky bottom, and at 1,600 yards the sands are dry at low water. The southwestern end is steeper than any other part of these shoals, there being $4\frac{1}{2}$ fathoms close to it, but there is, nevertheless, sufficient warning by the lead, since the depth of 5 fathoms is nowhere less than $\frac{1}{2}$ mile from their edge.

Caution.—The southern part of these shoals may be approached to any convenient depth, and the lead must be constantly used when in their vicinity, for the directions and rates of the tidal streams, which

meet off them, are variable. The ebb stream from bay Verte also frequently sets towards these shoals.

Whistling buoy.—A red whistling buoy is moored southward of Tryon shoals with Leard's range front lighthouse bearing 24° distant 4 miles, and Carleton head just open of cape Traverse.

Leading mark.—Carleton head in line with cape Traverse, 311° , clears the southwestern point of the shoals in 5 fathoms.

Tryon river lies eastward of Tryon head, and flows by a very narrow channel through the western part of Tryon shoals. There is 1 foot of water over the bar of this channel at low water springs, but the depth increases to 11 feet for a short distance within, and then the channel becomes still narrower, winding through flats of sand, mud, and weeds to the bridge, a distance of nearly 3 miles, following the channel. Small schooners enter Tryon river, near high water, the tidal rise being 6 to 8 feet. There are flourishing farms on each side of the river.

The coast from Tryon head trends about westward, $4\frac{1}{2}$ miles to cape Traverse, and contains three coves, named Cumberland, Augustin, and Provost, which are separated by points of cliff, and are dry at low water. The 5-fathom curve of soundings is 2 miles south-southwestward of Tryon head, whence it runs to about $\frac{1}{2}$ mile off cape Traverse.

From cape Traverse the coast trends northwestward, $2\frac{3}{4}$ miles to Carleton head, and thence northwestward 6 miles to Sea Cow head or Salutation point. The points between these headlands are formed of red sandstone and clay cliffs, with coves between, affording shelter and landing for boats, and also, with wind off the land or in fine weather, anchorage for small craft. Shallow water does not extend beyond 600 yards off either of these headlands northwestward of cape Traverse; but in the bays its 3-fathom edge is sometimes 1,200 yards from the shore, and as the line of 5 fathoms is sometimes very close to that of 3 fathoms vessels should not approach to a depth of less than 7 fathoms.

Ice boats.—Provision is made for communication in winter by ice boats from cape Tormentine to Traverse cove, on the north-western side of cape Traverse, whence a branch railway, 13 (land) miles long, runs to Emerald junction, where it connects with Prince Edward Island main line.

Light.—A white octagonal lighthouse, with a red lantern, 60 feet high, on the extremity of the low flat point of Sea Cow head, exhibits at 88 feet above high water a flashing white light, showing 2 bright flashes of 0.64 seconds duration every 10 seconds; thus, flash 0.64 seconds, eclipse 1.86 seconds; flash 0.64 seconds, eclipse 6.86 seconds,

which should be seen in clear weather a distance of 15 miles. There is a white dwelling near the lighthouse.

Bedeque bay, containing Bedeque harbor and Sandbury cove, lies between Sea Cow head and Little Dutchman Rock point, which bears 298° , 9 miles from the former.

Bank.—A bank of comparatively shoal water commences at Sea Cow head, and terminates at cape Egmont, which bears 290° distant $14\frac{1}{2}$ miles. The bank extends $3\frac{1}{2}$ miles offshore, through Bedeque bay, and its southern edge, in 5 fathoms forms an excellent guide for vessels; but if of heavy draft they should not venture within that depth, as there is in one place a shoal of 19 feet, with rocky bottom.

Bedeque harbor.—Indian head lies $3\frac{1}{2}$ miles northward of Sea Cow head, and Bedeque harbor runs in eastward between Indian head and Phelan point, which bears 321° , 1.3 miles from it. Indian head is faced by sandstone cliffs 25 feet high, and rises to double that height a short distance back from the shore; Phelan point is comparatively low and wooded. The Roman Catholic church eastward of Phelan point is very conspicuous, and forms a good mark from the offing. Indian spit, which dries out $\frac{1}{2}$ mile from the head, and the shallow water off the opposite shore, leave a channel into the harbor about 500 feet wide with a depth of 18 feet least water, abreast Indian Spit lighthouse. Indian island is about 800 yards eastward of Indian head, with which it is connected by sand banks; and Island shoal extends 1,000 yards northward of the island. The channel passes northward of this shoal, and then turns southward and passes eastward of the island, where vessels may lie quite landlocked in 5 fathoms water. The harbor within Indian Spit lighthouse up to the wharves of the town is from 400 to 1,200 feet in width with a least depth of 3 fathoms.

Wilmot river, which has a west-northwesterly course, flows into the harbor northeastward of Indian island; it has a depth of 3 feet, and is obstructed by oyster beds; a bridge crosses the river 2 miles from the island.

Dunk river, forming the main branch of the harbor, flows northward on the eastern side of Indian island, from which it can be ascended for $1\frac{1}{4}$ miles. From the deep water of Dunk river a channel, 2,700 feet in length and 250 feet in width, has been dredged to a depth of 12 feet at low water, up to a pier at Hird point, situated about $2\frac{1}{2}$ miles southward of Summerside town. This pier, being 510 feet long and the outlet of a large and rich agricultural district, is an important shipping place. The river channel just above the pier becomes obstructed by oyster beds, so that it is intricate, with a depth of only 4 feet. One and one-half miles farther up on the left bank is Pope's wharf, and $\frac{1}{2}$ mile above this wharf the river divides into two

narrow and shallow channels, crossed by bridges at the distance of 1 mile.

Navigability.—A depth of 18 feet at low water ordinary springs can be carried across the bar into the harbor, but the channel is intricate.

Roadstead.—Anchorage in the roadstead, which lies between the shoals extending westward from Indian head and Miscouche bank, is safe in summer, although it is open to southwesterly winds, the shallowness of the water, and the land about 13 miles distant to the southwestward, preventing the sea from becoming very heavy. The best anchorage is in 22 feet at low water, sand and clay bottom.

Lights.—A white octagonal lighthouse, 42 feet high, on a circular stone pier, situated on Indian spit, exhibits, at 48 feet above high water, a fixed white light, but with a green sector between 50° and 90° over Miscouche shoals, which should be seen, in clear weather, a distance of 13 miles.

Range lights.—On the roof of the freight shed on the railway wharf at Summerside a square tower, 30 feet high, exhibits, at 33 feet above high water, a fixed light, showing white, except when bearing 70° and over a small arc on either side of this bearing when it is red, which should be seen, in clear weather, a distance of 10 miles.

A square, pyramidal. white lighthouse, 56 feet high, situated 70° $\frac{3}{4}$ mile from the preceding lighthouse, exhibits, at 65 feet above high water, a fixed red light, which is visible when bearing 70° and over a small arc on either side of that bearing, and should be seen, in clear weather, a distance of 8 miles.

Buoyage.—Miscouche Bank black buoy.

A red conical buoy, No. 2, is moored in 20 feet water at 286° , 200 yards from Indian Spit lighthouse.

A red cask is moored in 20 feet water at 27° , 100 yards from Indian Spit lighthouse, to mark the end of the spit.

A black can buoy, No. 3, is moored in 20 feet water at 72° , 700 yards from Indian Spit lighthouse.

A red buoy, No. 4, is moored in 20 feet water at 250° , 1,000 yards from the wharf lighthouse.

The northern side of the channel opposite Island shoal is generally marked by stakes with bushes on the top.

Breakwater.—A breakwater is being constructed a distance of 1,050 yards, from Indian head to the outer side of the sand spit, on which the lighthouse is built.

Ice.—The harbor is usually frozen over about December 11, and is clear of ice about April 16, being completely closed between those dates. The first vessel arrives about April 24, and the last one leaves about December 11.

Directions.—The assistance of a pilot being indispensable to enter Bedeque harbor, it may be advisable to anchor in the roadstead outside until one is obtained.

For the roadstead, from the eastward, when about 1 mile westward of Sea Cow head, steer northward, not decreasing the water to less than 20 feet, and anchor in 20 to 24 feet water, with the northern ends of Indian head and island in line 65° and Sea Cow head 160° , or, if desired farther in, with Indian Spit light bearing 50° . At night anchor when Indian Spit light bears 39° and Sea Cow head 160° . If desiring to go farther in, continue the northerly course until Indian Spit light shows green, then anchor.

Approaching from the northwestward, when about 1 mile southward of Miscouche Bank gas buoy, steer about 27° for the same position as above. At night, anchor with lights on bearings given above unless going to the inner anchorage. In that case change course to the northward when Sea Cow light bears 160° and anchor when Indian Spit light shows green.

To enter the harbor, steer about 34° for No. 2 buoy, observing that the shoal off Indian head is very steep. Leave No. 2 buoy 200 feet on the starboard hand, and steer to leave No. 3 buoy 200 feet on the port hand; then steer to leave No. 4 buoy 200 feet on the starboard hand, whence make a direct course to the railway wharf. This route, which crosses the line of the range lighthouses four times, carries a least depth of 17 feet at low water, but owing to the narrowness of the channel it should not be taken without local knowledge.

The two red lights kept in line 70° after rounding the red buoy to the northeastward of Indian Spit light, lead up to the railroad wharf in not less than 15 feet of water. Vessels wishing to pass the wharves and enter the Dunk river branch of the harbor must leave the range lights on the port hand by changing course to the southward after passing Green's wharf.

Tides.—It is high water, full and change, at Green's wharf on the north shore of Bedeque harbor, at 10h. 15m.; springs rise 7 feet, neaps 5 feet.

Summerside, a town containing 2,875 inhabitants in 1901, is on the northeastern side of Bedeque harbor. From the town a steam ferry runs across the harbor to Indian island, where a large hotel has been built.

Wharves.—From the town several wharves extend into the harbor; of these the railway wharf, which is connected with the railway, is the principal, being 500 feet long, with a depth of 22 feet at its end at low water.

Storm signals are exhibited at Summerside.

Coal.—There are usually some 700 tons of soft Nova Scotia coal in stock, besides about 1,100 tons kept by the railroad. Vessels of 20

feet draft coal alongside the railroad wharf; but coal can also be supplied in lighters, the lighters being loaded in bulk.

Supplies.—Meat, vegetables, and bread are procurable. Water, which is obtained from the town pumps, is very bad.

Repairs.—There are no facilities for repairs.

Communication—Telegraph.—There is daily communication in summer between Summerside and Chêne point by steamers of the Charlottetown Steam Navigation Company. A steamer of the Quebec Steamship Company, running between Montreal and Pictou, calls at Summerside fortnightly both ways.

There is a station of Prince Edward Island railway at Summerside, which is also connected by telegraph with the rest of the island and with the mainland.

The United States is represented by a consular agent.

Miscouche bank.—Miscouche point lies 273° , 2.2 miles from Phelan point; and Miscouche bank, which dries out $1\frac{1}{4}$ miles from Miscouche point, extends nearly 3 miles southward from the point to the depth of 3 fathoms, sheltering from westerly winds the roadstead in Bedeque bay, outside Bedeque harbor.

Buoys.—A black can buoy, No. 1, is moored on the southern part of the bank, in 17 feet water, with Indian head bearing 65° , distant 2.8 miles.

A black, cylindrical steel gas buoy, surmounted by a pyramidal steel frame supporting a lantern from which is exhibited an intermittent red light, is moored in $3\frac{1}{2}$ fathoms, on the southeastern end of Miscouche shoal, with Sea Cow head bearing 133° , distant 3 miles, and Indian Spit lighthouse 45° , distant $2\frac{3}{4}$ miles.

Clearing mark.—The northwestern ends of Indian head and Indian island in line, bearing 65° , clear the southern side of the bank in 13 feet water, but the lead and the buoys are sufficient guides when a greater depth is required.

Sandbury cove, westward of Miscouche point, is extensive, but nearly dry at low water, except a narrow channel through the flat, suitable only for boats or very small craft. Miscouche church is inland $2\frac{3}{4}$ miles north-northeastward of Miscouche point.

Little Dutchman rock, at the end of the point on the western side of Bedeque bay, is situated 5 miles westward of Miscouche point. The rock is above water but low, and in its vicinity shallow water extends a long mile offshore; the depth then increases to nearly 4 fathoms for 2 miles farther off, and then decreases again to $3\frac{1}{4}$ fathoms over sandstone bottom not far from the 5-fathom curve. Fifteen Point church bears from the shallow part nearly 337° , distant 3 miles.

Fifteen point, with a settlement and a church near the shore, visible from a distance, either eastward or westward, is westward $1\frac{1}{4}$ miles from Little Dutchman rock. The Roman Catholic church is a white building, with a white spire, a light brown roof, and a small white nave with a black top. A tall white beacon stands a little eastward of it.

The coast of Prince Edward island from Fifteen point trends westward $4\frac{1}{4}$ miles to cape Egmont; shoal water which extends $1\frac{1}{4}$ miles off the middle of it, then gradually approaches the cape.

Cape Egmont is a headland with cliffs of sandstone 50 feet high, and is quite bold to the southward, but to the westward has shallow, rocky ground $\frac{1}{2}$ mile offshore.

Light.—A square, white lighthouse, 45 feet high, with a dwelling attached on its eastern side, situated at the extremity of cape Egmont, exhibits at 72 feet above high water a flashing white light, giving 1 bright flash of 1 second's duration every 5 seconds, which should be seen in clear weather a distance of 10 miles.

The lighthouse is in latitude $46^{\circ} 24' 20''$ N., longitude $64^{\circ} 07' 45''$ W.

Egmont bank, of fine red sand, with 4 fathoms least water, is a narrow ridge $2\frac{1}{2}$ miles long, northwest and southeast. Its southern end bears $239^{\circ} 4$ miles from cape Egmont, and there is a clear channel, 7 to 8 fathoms in depth, between it and the cape.

NORTHUMBERLAND STRAIT, EAST SHORE.

Egmont bay, between cape Egmont and West point, which bears 321° , distant 17 miles, is 8 miles deep, and affords excellent anchorage with offshore winds, in 4 to 7 fathoms, sand and clay bottom; but vessels should not anchor in less than 5 to 6 fathoms except on the northwestern side of the bay, because, along the eastern shore 5 fathoms is too near the edge of the shoals, while off the river at the head of the bay, just within the 5-fathom curve, and 3 miles from the shore, there is rocky ground, with only $3\frac{1}{2}$ fathoms water.

The shore of Egmont bay from cape Egmont trends about 346° , $1\frac{1}{2}$ miles to Red head or Dutchman point; and 8° , $\frac{1}{2}$ mile from the head, and 200 yards offshore, is Dutchman rock, 30 feet high and isolated. Shallow rocky ground extends $\frac{1}{2}$ mile off all this shore, which should not be approached to a less depth than 6 fathoms at low water. About 1 mile northeastward of Dutchman rock there are sand hills, which form the outer or western entrance point of Haldimand river, which is shallow and runs in southward, about 2 miles.

From the sand hills, a sand bar, dry at low water, extends about $3\frac{1}{2}$ miles northward, parallel to the shore. Through this sand bar there are some very narrow channels, which are said to sometimes shift

during heavy westerly gales. At the time of the Admiralty survey, the principal channel was pointed out by two small beacons, situated on the shore at about 1 mile southward of St. Jacques church. These beacons in line, bearing 104° , led over the bar, whence a southerly course was taken into a harbor, with 5 feet in it, suitable for small craft, and extending to Haldimand river entrance.

The eastern side of Egmont bay, northward of Dutchman rock, should not be approached to less depth than $5\frac{1}{2}$ fathoms in a large vessel, for the shallow water off the bar of St. Jacques and Rock point extends 1 mile from the shore. St. Jacques church is conspicuously situated 5 miles northeastward of cape Egmont, having the French or Acadian settlement along the ridge northward of it, and the small river St. Jacques, with its sawmills, half a mile southward of it. The church is white, with a red roof, and a yellow tower with a portico attached.

Enmore and Percival rivers, at the head of the bay, having a depth of 4 to 7 feet at low water, are useful only to boats and very small craft; they are approached by exceedingly narrow and intricate channels through flats of sand, clay, and oyster beds, which dry in part at low water, and extend $1\frac{1}{2}$ miles from the shore. The tide flows about 5 miles up these rivers, between low and marshy banks.

Brae and Wolfe river entrances, on the northern shore of the bay, are sandy places dry at low water.

Tides.—It is high water, full and change, in Egmont bay at 3h. 0m.; springs rise 4 feet, neaps 2 feet.

West point of Prince Edward island consists of sand hills 12 feet high, from which, except in the direction of West spit, shallow water does not extend far. A pier extends 720 feet from the point into a depth of 9 feet at low water; but a sand bank, with 7 feet water over it, has formed a short distance off the end of the pier.

Light.—A square lighthouse, 67 feet high, with a dwelling attached and painted red and white in broad horizontal bands, on the sand beach at West point, exhibits at 66 feet above high water a revolving light, showing one red and three white flashes every 90 seconds, the flashes attaining their greatest brilliancy every $22\frac{1}{2}$ seconds, which should be seen in clear weather a distance of 13 miles.

Anchorage.—There is good anchorage under West point in northerly to easterly winds, in 4 fathoms, sand.

Tides.—It is high water, full and change, at West point at 6h. 40m.; springs rise 4 feet, neaps 2 feet.

West spit of sand upon sandstone, covered in some parts with only a few feet of water, runs northwestward 3 miles from West point, and then trends northward nearly 2 miles within West reef. There is a “cul de sac” between the spit and the shore, open to the north-

ward, in which there are 6 to 4 fathoms water. To avoid getting into this opening, or within West reef, when running from the northward vessels should not approach the island nearer than the low water depth of 11 fathoms.

West reef is a narrow and rocky ridge, 4 miles long north-north-west and south-southeast, with irregular soundings of 16 feet to 5 fathoms. The least water, 16 feet, is near the middle of the reef, and there is a depth of 18 feet near its southern end, which bears 292° , $3\frac{1}{2}$ miles from West point, and is $2\frac{1}{2}$ miles from the nearest land. Its northern end is $3\frac{1}{2}$ miles off the shore at the highest part of the cliffs between McWilliam cove and cape Wolfe.

There are no leading marks for this reef, and as there are 13 fathoms in one place close to its outer edge it can be certainly avoided in thick weather only by following the bank of soundings off the mainland in 9 to 10 fathoms, which leads 3 miles westward of it. There is a passage within the reef, between it and West spit, but it is narrow with irregular soundings and strong tidal streams and should therefore not be attempted.

Whistling buoy.—A red conical whistling buoy, with “West Point reef, P. E. I.,” on it in white letters, is moored in 13 fathoms about $\frac{3}{4}$ mile westward of West reef, with West Point lighthouse bearing 123° , distant $5\frac{3}{4}$ miles.

Tidal streams.—The rate and direction of the tidal streams about West reef are very irregular, being influenced by winds, and varying with the time of tide, and probably with the age and declination of the moon. (See the peculiar tides at Shediac and Richibucto at pp. 177 and 186, which also occur in Egmont bay.) In the deep-water channel passing close westward of West reef, the rate of the stream sometimes amounts to $2\frac{1}{2}$ knots an hour, the ebb there setting northward and the flood southward, the streams causing a heavy sea when setting against the wind.

The west coast of Prince Edward island, from West Point, curves northward 6 miles to cape Wolfe, and thence northeastward 27 miles to North point; it is unbroken, and of red clay and sandstone cliffs, with intervening sandy beaches which afford landing for boats in fine weather. There are several ponds along this coast where fishermen's boats obtain shelter; but their outlets through sandy beaches are nearly dry at low water and the channels constantly change their positions, being completely blocked at times during heavy gales. Amongst these are Roseville, Miminegash (see below), Black, and Nail ponds. Shallow water runs out to considerable distances off various parts of this coast, as much as 2 miles off Nail pond, and, as a general rule, it should not be approached nearer than the depth of 11 fathoms at night, or in thick weather.

Miminegash reef is a ledge of rocks nearly dry at low water, and nearly 1 mile in length parallel to the shore, from which its outer edge is distant $\frac{1}{2}$ mile. It lies directly off the sandy beach, and across the outlet of Miminegash pond, which is 12.3 miles from cape Wolfe. There are $2\frac{1}{2}$ fathoms water between the reef and the shore, and vessels have moored there during summer to take in cargoes of lumber, but it is a very unsafe place.

Miminegash pond, where there is a village and which is available only for very small craft, is situated within Miminegash reef. Breakwaters or piers, on either side of the entrance, 56 feet apart, confine and keep the channel into the pond from shifting. The northern breakwater is 550 feet long; the southern, 350 feet.

Range lights.—A square white lighthouse, 17 feet high, on the outer end of the southern breakwater, exhibits, at 17 feet above high water, a fixed light, which shows red from 56° , through east, to 135° ; white from 135° , through south, to 198° , and is obscured elsewhere; it should be seen, in clear weather, a distance of 6 miles.

A square white lighthouse, 27 feet high, situated on the beach of the pond 168° , 240 yards from the preceding light, exhibits, at 28 feet above high water, a fixed white light, which should be seen, between 56° , through east and south, to about 198° or until cut off by the highland to the northeastward of the lighthouse, in clear weather, a distance of 10 miles.

These lighthouses or lights in line, 168° , lead to the entrance of the pond.

Buoys.—The southern channel inside Miminegash reef is marked by three spar buoys, painted black and white in vertical stripes, moored in mid-channel.

Anchorage.—There is good anchorage for small vessels with off-shore winds, in 3 fathoms water, near a spar buoy, about $\frac{1}{2}$ mile northwestward of the north breakwater.

Tides.—It is high water, full and change, at Miminegash, at 3h. 30m.; springs rise 5 feet, neaps 3 feet.

Shallow water extends 2 miles off Nail head, and $1\frac{1}{2}$ miles off Nail pond, which are 6 miles and 3 miles, respectively, southwestward of North point.

North point of Prince Edward island is of low red cliffs. A reef extends from it northward and eastward $1\frac{1}{4}$ miles to the depth of 3 fathoms, and nearly 2 miles to 5 fathoms; rocky and irregular soundings of 6 to 7 fathoms continue northeastward, causing at times a dangerous breaking sea, and terminating in a small patch of rocks, on which there is a depth of 4 fathoms, bearing 22° , $4\frac{1}{4}$ miles from North point. Vessels should give this reef a wide berth in thick weather, or at night, being guided by the soundings; it is

most steep on the western side, where there are 10 fathoms at the distance of 600 yards. The inner part of the reef dries out $\frac{1}{2}$ mile from the point, affording shelter to fishing schooners, which shift from side to side as the wind changes.

Light.—A white octagonal lighthouse, 60 feet high, with a red lantern, and with a dwelling near it, on North point, exhibits, at 80 feet above high water, a revolving white light, which attains its greatest brilliancy every minute, and should be seen in clear weather a distance of 14 miles.

Position.—The lighthouse is in latitude $47^{\circ} 03' 41''$ N., longitude $63^{\circ} 59' 19''$ W.

Directions for Northumberland strait. (See p. 141.)

EAST COAST OF PRINCE EDWARD ISLAND.

Cape Bear and light. (See p. 190.)

The eastern coast of Prince Edward island from cape Bear trends nearly northward about 1 mile to Murray head, the extreme north eastern point of the cliffs, whence they turn abruptly westward toward Murray harbor.

Bear reef, of sandstone and large stones, extends eastward, from between cape Bear and Murray head, $\frac{3}{4}$ mile to the depth of 3 fathoms, and 1 mile to 5 fathoms. There is but little water over the greater part of this extensive and irregularly shaped reef, which has 7 to 8 fathoms close to its edge, and the southern and eastern sides of which should not be approached nearer than the depth of 10 fathoms.

Leading marks.—Guernsey point well open southward of Black Rock point leads southward of Bear reef; Panmure head and Terras point in line, bearing 344° , leads nearly a mile eastward of it; at night the light on Panmure head must be kept open of Terras point.

Water.—At 700 yards southward of Murray head, there is a fine little stream of fresh water, which is one of the few places on the island where a large vessel can readily water. Boats can land at the stream during westerly winds, when vessels will find good anchorage under Murray head.

Fishermans bank, from the shoalest part of which Murray head bears 273° , distant $7\frac{1}{2}$ miles, is of sandstone, thinly covered with stones, gravel, the broken shells; it is 3 miles long east-northeast and west-southwest, and $1\frac{1}{2}$ miles broad, within the depth of 10 fathoms; and the general depth over the bank is 8 to 9 fathoms, but in its central part there are two patches, the shoalest of 4 fathoms, mentioned above, and one of 5 fathoms $\frac{3}{4}$ mile farther eastward. There are irregular soundings of 10 to 20 fathoms between this bank and Bear

reef, and in other directions around the bank, of 15 to 20 fathoms. It should not be approached at all by vessels of heavy draft; and by vessels of light draft, when there is a heavy sea running, not nearer than the depth of 13 fathoms, which in most parts is close to its 10-fathom edge, and about $\frac{1}{2}$ mile from the shallow water.

Murray harbor entrance, which is in the bay between Murray head and Cody point, lying 346° , $2\frac{1}{4}$ miles from it, has an exceedingly dangerous bar of sand, over which 10 feet can be carried at low water ordinary springs; but strong easterly winds send in so heavy a sea as to render it at times impassable, a line of breakers extending then completely from Murray head to Cody point.

Within the bar, the channel into the harbor, between sandy shoals extending from the shore on either side, contracts gradually in breadth to 120 yards, and expands again to 400 yards inside Old Store point, the sandy southern entrance point, situated about 1 mile from the outer edge of the bar. The depth inside the bar gradually increases to 6 fathoms close to the steep sandy beach of Old Store point.

The harbor entrance between Old Store point and the long sandy spit, which runs south-southwestward from Cody point, is over $\frac{1}{2}$ mile wide, but, except the channel, it is nearly all dry at low water. Within this entrance the harbor is of great extent, but greatly obstructed by shoals, and it contains five wooded islands, and several rivers or sea-creeks on either side, in addition to Murray river, the main inlet, which is navigable for about 6 miles from the harbor entrance, or nearly to the dam which crosses it near its head.

There are flourishing settlements on the shores of the rivers, the principal one being at South river, on the southern shore 2 miles inside the harbor entrance, where there is an Episcopal church, with a steeple.

Range lights.—A square white lighthouse, 20 feet high, on Old Store or Beach point, exhibits at 23 feet above high water, a fixed white light, which should be seen in clear weather a distance of 8 miles.

A square white lighthouse, 40 feet high, on the mainland at 236° , 1,500 yards from the preceding light, exhibits at 57 feet above high water, a fixed white light, which should be seen in clear weather a distance of 10 miles.

Buoys.—A buoy is moored in 3 fathoms on the outer edge of the bar, with the leading lighthouses in line, bearing 236° . A buoy is moored in the fairway $\frac{1}{2}$ mile within the outer one; it is intended to enable vessels to run in when hazy weather prevents the leading mark from being seen.

Storm signals are exhibited from a mast on Humes hill, Beach point.

Tides.—It is high water, full and change, in Murray harbor at 9h. 6m.; springs rise $6\frac{1}{4}$ feet, neaps $3\frac{1}{4}$ feet. The rate of the tidal stream at the anchorage within Old Store point is about 2 knots.

Directions.—Local knowledge is very desirable owing to the narrowness of the channel. While seaward of the bar and in not less than 5 fathoms water, bring the white range lighthouses, or their lights, in line, bearing 236° . Do not mistake the night storm signals for the range lights. Proceed in with the range on until 350 yards from Old Store point, when steer to pass that point at less than 100 yards distant. Pass both buoys close-to. Anchor in 3 to 5 fathoms sand and clay bottom, at any distance not exceeding $\frac{1}{4}$ mile within Old Store point, because farther in, the channel, which passes southward of the islands, becomes very intricate, and can not be followed without a pilot.

Railroad.—A branch of the Prince Edward Island railroad is extended to Murray river.

The coast from Cody point trends north-northeastward nearly 2 miles to Reid point, thence northward $1\frac{1}{2}$ miles to Terras point, and northwestward 1 mile to Smith point.

Graham point is a small projection nearly midway between Reid and Terras points, and from it Graham ledge runs out 1 mile to the depth of 5 fathoms and $\frac{3}{4}$ mile to 3 fathoms. The shallowest part of this ledge, with 6 feet least water, bears 44° , 800 yards from the point. A rocky shoal runs out $\frac{3}{4}$ mile from between Terras and Smith points, and foul ground with 4 to 5 fathoms at low water extends $1\frac{1}{2}$ miles off Smith point. The soundings are very irregular off the coast between Graham point and Panmure head, varying from 13 fathoms, mud, to $5\frac{1}{2}$ fathoms, rock, until beyond 3 miles from the shore.

Graham pond, a boat harbor on the northern side of Graham point, is about $\frac{1}{2}$ mile long and 600 to 800 feet wide, with a usual depth of 6 to 8 feet over its outer part. Works have been undertaken to protect the entrance.

Sand bar.—A narrow sand bar, always above water, $1\frac{1}{4}$ miles in length, trends northward from Smith point and joins it to Panmure head, the eastern point of Panmure island.

Panmure island is about 2 miles long east-northeast and west-southwest and 1 mile wide, in great part wooded, and has cliffs of red sandstone 40 feet high along its northeastern shore. The island is joined to the land southward of it by a sand bar more than 1 mile in length which is always above water.

Light.—An octagonal white lighthouse, 50 feet high, with a dwelling attached, on Panmure head exhibits at 96 feet above high water a fixed white light, which should be seen in clear weather a distance

of 16 miles. Fir trees growing round the lighthouse partly obscure it and render it inconspicuous.

Panmure ledge, of sandstone covered by 7 to 11 feet of water, extends 1,200 yards southeastward from Panmure head to the depth of 3 fathoms; Graham point and Murray head in one, bearing 182° , leads just eastward of the outer part of the ledge in over 5 fathoms.

Buoy.—A spar buoy painted in red and black horizontal bands is moored in 7 fathoms water off Panmure ledge, with Panmure Island lighthouse bearing 280° , distant 1 mile.

Deep-draft vessels entering Georgetown harbor should leave the buoy on the port hand.

Cardigan bay, the entrance to which is between Panmure head and Boughton point, the southern end of Boughton island, lying 3.4 miles 56° from Panmure head, extends northwestward about 4 miles.

The bay affords good anchorage in 6 to 10 fathoms, mud bottom, with offshore winds, but winds from south-southwest to northeast, through south, send in a heavy sea.

Georgetown harbor, sometimes called Three rivers, extends northwestward from the southwestern part of Cardigan bay; it is a fine harbor and has space and depth sufficient for large vessels. The rise of ordinary spring tides being only 5 feet is a great disadvantage as compared to Charlottetown; but, on the other hand, the ice does not, in general, form in Georgetown as soon in the fall by several weeks, and it also breaks up earlier in the spring, so that vessels can enter later and leave it earlier, or vice versa. This is an important advantage in a climate where navigation is closed by ice for so much of each year.

The channel leading to the entrance of the harbor passes between the shoals of Panmure island and Cardigan point, which separates the harbor from Cardigan river.

Panmure shoal extends 1,400 yards off the northern coast of Panmure island, and Panmure spit, which forms the western part of the shoal, and is of sand dry at low water, extends northwestward 1,300 yards from Billhook point, the northern point of the island. The northern part of Panmure spit, which is named Wheeler bar, is covered with 2 to 9 feet of water; its northern side is steep-to.

Panmure shoal and spit, and farther in, the equally steep shoals off Grave and St. Andrew points, are on the southwestern side of the channel leading to Georgetown harbor.

Buoys.—A black spar buoy is moored in 5 fathoms with Panmure Head lighthouse bearing 227° distant 950 yards.

A black spar buoy is moored in 5 fathoms off the northeastern part of Panmure shoal, with Panmure Head lighthouse bearing 130° , $1\frac{1}{4}$ miles.

A black spar buoy is moored in 17 feet on the shoal extending eastward from Grave point with St. Andrew Point lighthouse bearing 298° , 1,400 yards.

St. Mary bay is south-southwestward of Panmure island and within the sand bar connecting the island to Smith point; and farther westward are Sturgeon and Livingstone bays, all three of these bays having a common entrance northwestward of Panmure island, between Panmure spit and the shoal off Grave point; which entrance, although very narrow, has water sufficient for vessels of moderate draft. The channel leading to Sturgeon and St. Mary bays is very intricate, and though it is marked by two red and two black spar buoys, a local pilot is necessary to navigate it.

In the southern part of St. Mary bay there is a pier 407 feet long, with a basin at its outer end, from which a channel having 10 feet at low water has been dredged to deep water (3 fathoms); and also there is, on the southern side of Sturgeon bay, about $\frac{1}{4}$ mile eastward of the mouth of Sturgeon river, a pier to which a channel, 100 feet wide, has been dredged to a depth of 12 feet at low water.

Cardigan shoal, stretching southward and eastward from Cardigan point, which separates the harbor from Cardigan river on the northwest, is an extensive shoal of sandstone, having a least depth on it of 4 feet and only 6 feet at $\frac{1}{2}$ mile from shore; but 200 yards farther out there are 3 fathoms.

Buoys.—A red conical buoy is moored in 5 fathoms southward of the shoal, with Cardigan point bearing 314° , 1.1 miles.

A red cask buoy is moored in 5 fathoms southwestward of the middle of the shoal, with Cardigan point bearing 341° , 800 yards.

Outer anchorage.—There is anchorage in 26 to 29 feet, mud, between Cardigan shoal and Knoll shoal, in a space about $\frac{1}{2}$ mile long, east and west, and 700 yards broad.

The Knoll is a small shoal, with 9 feet least water, sand over sandstone bottom, which lies just outside the entrance of Georgetown harbor and directly in the way of its navigation.

Buoy.—A red cask buoy is moored in 18 feet on the southern side of the Knoll, with St. Andrew Point lighthouse bearing 254° , distant 1,000 yards. Shoal water extends 175 yards westward from the buoy.

Thrumcap spit, which extends westward nearly $\frac{1}{2}$ mile from the western point of Cardigan Point headland, is of sand, having the greater part of it dry at low water. This shoal shelters the harbor and prevents heavy seas from entering.

Thrumcap islet, which is joined to the western point of Cardigan Point headland by a sand bar, is small, wooded, and cliffy.

Buoy.—A red can buoy is moored in 18 feet near the western end of Thrumcap spit, with St. Andrew Point lighthouse bearing 201° 800 yards.

The entrance to Georgetown harbor, with depths between 5 and 11 fathoms between Cardigan and Panmure shoals, is 500 yards wide; at the Knoll it is scarcely 400 yards: while between Thrumcap islet and St. Andrew point on the southwestern shore it is nearly $\frac{3}{4}$ mile wide, but the shoals here diminish the breadth of the channel to 450 yards.

Within the Thrumcap the northern shore of the harbor forms a bay $\frac{3}{4}$ mile wide, the northwestern point of which is Gaudin point, having a sand spit running out from it southwestward $\frac{1}{4}$ mile.

Buoy.—A red spar buoy is moored in 20 feet at the end of Gaudin spit, with St. Andrew Point lighthouse bearing 145° , 0.85 mile.

Aitkins point lies on the southern shore of the harbor $\frac{1}{2}$ mile westward of Gaudin point. A shoal runs out 200 to 500 yards off the southern shore from St. Andrew point to Aitkins point, and continues westward in the entrance of Montague river. Between Gaudin spit and Aitkins point the channel is 375 yards wide, between depths of 3 fathoms, and carries $6\frac{1}{2}$ fathoms water; it expands again but shoals to 4 fathoms within the spit.

Buoys.—A black cask buoy is moored in 19 feet on Aitkins Point shoal with St. Andrew Point lighthouse bearing 130° a little more than 1 mile.

A red spar buoy is moored in 12 feet water, with Brudenell point bearing 37° , 600 yards.

Anchorage.—The usual and best anchorage for large vessels in Georgetown harbor is in about 5 fathoms water, with good holding ground of mud, between Thrumcap spit and Gaudin Point spit, having the shore end of the town wharf distant 900 yards and in line with the square tower of the English church 5° ; small vessels anchor farther within the bay, according to their draft, and will find a depth of 17 feet 200 yards from the town wharf.

There is also anchorage all the way to Brudenell point, 1 mile above the town.

Range lights.—A square white lighthouse, 34 feet high, with red lantern rising from roof of dwelling, on St. Andrew point, exhibits at 50 feet above high water a fixed white light, which should be seen in clear weather a distance of 8 miles.

A square white tower, 46 feet high, on Westaway's farm 279° , 700 yards from the preceding light, exhibits at 62 feet above high water a fixed white light which should be seen, when in line with St. Andrew Point light, in clear weather, a distance of 12 miles. The light is also visible across the harbor to Georgetown.

These two lights in line 279° lead in from seaward until the Railroad Wharf light opens.

Railroad Wharf light.—A square white lantern on the roof of the coal shed with red sides, on the outer end of the railroad wharf, exhibits at 23 feet above high water a fixed red light, which should be seen in clear weather a distance of 2 miles.

When this light opens 321° from the range light's line it leads to the railroad wharf.

Ice.—Georgetown harbor is usually frozen over about December 26, and is clear of harbor ice about April 21, being completely closed from January until April. Field ice comes in from the middle of January until the end of April.

The ice generally forms in autumn in Georgetown harbor several weeks later than it does in Charlottetown harbor, and it also breaks up earlier in spring.

Directions.—Owing to the narrowness of some parts of the channel leading into Georgetown harbor, a pilot is required to beat a large vessel in or out; but with a fair wind, or in a steamer, the following directions may be used, by observing that caution is necessary.

Caution.—Reliance must not be placed on the buoys, as they are frequently out of position.

Approach.—From the southward pass eastward of Panmure ledge in not less than 7 fathoms, or by keeping Murray head open to the eastward of Graham point till the northern side of Panmure island bears 275° , and then steer northwestward until the lighthouses on St. Andrew point and at Westaway's farm are in line. If this mark is obscured by thick weather, the northern edge of Panmure shoal may be followed by the lead, in 6 fathoms, to $\frac{1}{2}$ mile from Panmure Shoal buoy. situated 310° , $1\frac{1}{4}$ miles from Panmure Head lighthouse, where the shoal becomes too steep for the lead to be a safe guide.

From the eastward pass 1 mile southward of Boughton point; then steer about 266° until the lighthouses on St. Andrew point and at Westaway's farm are in line. In thick weather the southern edge of Cardigan shoal may be followed, by the lead in 6 fathoms from the outer buoy to the inner buoy.

Enter the harbor with the lighthouses on St. Andrew point and at Westaway's farm in line, 279° , steering between Panmure and Cardigan shoals, and in the fairway until the Railroad Wharf light opens; then steer for that light 321° ; go slowly, and when the English church tower comes in line with the town wharf, 5° , anchor. These directions cross some $4\frac{1}{2}$ -fathom spots. If the vessel draws more than that and it is necessary to enter at low water, keep the range lights in line as above directed until Brudenell point bears 302° . Keep Brudenell point on that bearing until the steeple of the Roman

Catholic church is well open northwestward of the English church tower when haul into the harbor, and anchor as before directed.

In thick weather either bring up in the outer anchorage, or proceed into the harbor, as expedient, being guided by the soundings.

Caution.—Wheeler bar must be given a sufficient berth, as it is steep-to.

Tides.—It is high water, full and change, in Georgetown harbor at 8h. 40m., by the mean of the a. m. and p. m. tides, the latter being generally the later by about an hour in summer; springs rise 5 feet, neaps $3\frac{1}{4}$ feet. The rate of the tidal streams does not exceed $\frac{3}{4}$ knot.

Georgetown, the capital of Kings county, having about 1,060 inhabitants, is well situated on the northern shore of the harbor, just eastward of Gaudin point. Its streets, which are wide, are laid out at right angles. The principal buildings are the two churches above mentioned and the court-house.

Storm signals are exhibited at Georgetown.

Wharves.—The Railroad wharf extends south-southeastward about 800 feet from the shore just eastward of Gaudin point; there is a depth of 20 feet water at its outer end, and from 23 to 10 feet on its western side, but it can accommodate a vessel over 200 feet in length only if her draft is less than 10 feet forward. Besides the Railroad wharf there are the Town wharf, and four smaller wharves.

A pier, having depth of 10 feet at its outer end at low water, extends 391 feet off the shore on the southern side of the harbor near Aitkins point.

Supplies.—General supplies, including fresh water, may be obtained at Georgetown, but the water being obtained from wells, as in most other parts of the island, must be taken off in a vessel's own boats.

Coal.—About 300 tons are usually in stock, and the railroad department has generally about 550 tons.

Vessels of light draft can coal alongside the Railroad wharf. In summer, with short notice, coal can be brought alongside in schooners of 30 to 60 tons.

Communication—Telegraph.—A branch of the Prince Edward Island railway runs from mount Stewart to Georgetown. There is telegraphic communication with the rest of the island and with the mainland. There is steamer communication with Pictou once a week during summer: this service is continued, when possible, after the close of ordinary navigation, by a steamer specially constructed for breaking through ice, but she is usually unable to make the passage during February and March.

Brudenell and Montague rivers unite their streams at Brudenell point, westward of Georgetown harbor. Brudenell river, the northern of the two, is navigable for large vessels to Brudenell islet, $1\frac{1}{4}$ miles up, and for small craft and boats about 3 miles farther, to the head of the tide. Montague river can be ascended by vessels of considerable size nearly to the bridge, a distance of 4 miles, and by boats about 1 mile farther to where the tide ends. The fresh water streams at the heads of these sea creeks are mere brooks.

Cardigan river, which enters Cardigan bay on the northeastern side of Cardigan point, and which, with the two rivers mentioned above, has caused Georgetown to be called Three Rivers, is navigable for large vessels to the distance of 5 miles above Cardigan point, and for smaller vessels 2 miles farther, or to within $\frac{1}{2}$ mile of the head of the tide, where the fresh water is insignificant in quantity. This river is rendered somewhat difficult of entrance by MacPhee shoal and Maitland flat, which are very steep, and contract the navigable channel to 400 yards in width, the depth being 7 fathoms.

Light.—A square, white lighthouse, 32 feet high, situated close to the western shore of Cardigan river, at a short distance above South Ferry wharf and below Morrison beach, exhibits at 43 feet above high water a fixed light, which shows green seaward and white north-eastward across the river, and should be seen in clear weather a distance of 8 miles.

Directions.—Steer for a position in Cardigan bay, with Panmure Head lighthouse bearing 167° and Cardigan River lighthouse 291° , avoiding the shoals; then steer about 294° , keeping Cardigan River lighthouse on the port bow and thus clearing MacPhee shoal on the southern side of the river entrance and Maitland Point shoal on the northern side. When northeastward of Cardigan River lighthouse, or when its white light opens at night, the vessel will have reached safe anchorage off the south ferry slip.

Boughton island, at the northern entrance to Cardigan bay, is united on its northeastern side to Bruce point by a dry sand bar 1 mile in length and is divided into two parts, of which the southern, 700 yards long, is joined to the remainder by a double bar of sand and shingle inclosing a large pond. Boughton point, the southeastern end of the island, is a cliff of red sandstone 30 feet high, having to the southward a rock which dries and shallow water extending southward $\frac{1}{2}$ mile. Rocky and irregular soundings of 4 to 5 fathoms extend eastward 1 mile from the point, which should not be rounded in a less depth than 9 fathoms.

Boughton ledge runs out 200 yards eastward from the sand bar northward of Boughton point, and has rocks which always show near its outer extreme.

Cardigan bay—Northeastern shore.—A bank, with 3 to 5 fathoms, extends $1\frac{1}{4}$ miles westward of Boughton island, and farther westward shoals, together with Boughton spit and Mosquito sands, extend along the northeastern shore of Cardigan bay nearly to Maitland point at the entrance of Cardigan river. Between these shoals and the land to the northward there are narrow and intricate channels which lead into Launching bay. This side of the bay should not be approached nearer than the low-water depth of 5 fathoms.

Shallow water extends eastward nearly 1 mile off Boughton sand bar and Bruce point.

Boughton bay lies between Bruce point and Spry point, which bears 73° , 2.6 miles, and in the bay the 3-fathom curve of soundings is 1 mile out from the shore.

Boughton or Grand river, which flows into the northwestern part of Boughton bay, has, 1 mile out from its entrance, a dangerous bar of sand over which 6 feet, at low water ordinary springs, can be carried in a very narrow channel marked out by three buoys. The outer buoy is moored in 3 fathoms, the next in 2 fathoms, and the inner one in 11 feet, the bar of 6 feet being between the two last.

At a short distance within the inner buoy the sands on each side dry at low water, and the channel is generally visible all the remainder of the way to the entrance, where it passes close round the northern point of the long sand bar which stretches across from Solander point, on the southern shore, to within 375 yards of Banks point, upon which is Annandale village, and a wharf with a frontage on the channel of 140 feet and a depth of 7 feet at low water.

Immediately within the entrance the inlet is a mile wide, but the channel is divided, narrow, and intricate, and marked out by stakes between sandy shoals for about 1 mile, after which it is clear and wide, having 3 to 5 fathoms water to the narrows, 3 miles from the entrance. Boats can ascend 3 miles farther, or to the bridge.

There are flourishing settlements on each side of this extensive inlet. Chapel pier, on the southern side of the river, 3 miles within the entrance, is 293 feet long and has a depth of 9 feet at its outer end.

Range lights.—A square white tower, 13 feet high, surmounted by a red beacon with a white diamond, in Annandale village, at 46° , 100 yards from the shore end of the wharf, exhibits, at 28 feet above high water, a fixed white light, which should be seen, in clear weather, on and over a small arc on each side of the range line, a distance of 10 miles.

A square, white, open-framed lighthouse, slatted, facing the range line, 65 feet high, on Juniper point, at about 302° , 400 yards from the preceding light, exhibits, at 78 feet above high water, a fixed white

light, which should be seen, in clear weather, in the direction of the range line, a distance of 14 miles.

Beacon.—A diamond-shaped white beacon, 13 feet high, stands on a sand bank on the northern side of the channel southeastward of the front range lighthouse. The bank on which it is situated covers at high water, so that the beacon is surrounded by water for 3 to 4 hours at every high tide.

Tides.—It is high water, full and change, at Annandale wharf. Boughton river, at 8h. 40m.; springs rise 5 feet, neaps $2\frac{3}{4}$ feet. The rate of the tidal streams in the entrance is 2 knots.

Directions.—To enter the river bring the range lighthouses in line, 302° , and keep them so, past the buoys on the bar, until the beacon is about 50 feet distant on the starboard bow and until the back light is being obscured by the high land in front of the front range tower: then steer about 274° until the western end of the wharf is nearly in line with the lighthouse on Juniper point, bearing 308° , which mark leads to the wharf. Care must be taken not to overrun this last bearing, as the middle ground to the southward and southwestward of the wharf must be avoided. While entering the alignment of the lighthouses must be carefully kept, as the fairway inside the bar is very narrow at some places. There is good anchorage inside the bar on the line of the range lighthouses.

With an onshore breeze, which causes a breaking sea on the bar, the entrance should not be attempted by strangers.

The coast.—Souris head bears 39° , 6.3 miles from Spry point, and between them are Howe bay, into which flows Little river. Fortune bay and river, and Rollo bay. These are tidal inlets nearly barred up with sand, and having streams at their heads; they are suitable only for small craft and boats, having 3 to 5 feet over their bars at low water.

A breakwater has been built on the eastern side of Fortune river entrance in order to contract the channel and increase the scour over the bar at its entrance, so as to deepen the water. There are wharves on either side of the river.

Colville river, a similar inlet, is situated in Colville bay, between Souris head and Swanton point, which bears 76° , $1\frac{3}{4}$ miles, and in its entrance is Souris harbor. Colville bay affords good anchorage with offshore winds.

Sharp cliffy headlands and points of red sandstone separate the bays between Spry point and Swanton point, the cliffs being 25 to 50 feet high, and shallow water not extending off them more than 600 yards, except at Eglinton point, which separates Eglinton cove from Fortune bay, where the reef is shoal for 800 yards out from the shore, and continues 1,200 yards farther with a depth of 3 to $4\frac{1}{4}$ fathoms

over rocky bottom; but this is within the line joining Howe point and Souris head, and therefore out of the way of vessels running along the coast.

Souris head is bluff and covered with trees, while the point near it is of red sandstone and bare.

Souris harbor, which is on the eastern side of Colville bay, is important as a harbor of refuge and place of shipment. A breakwater, 417 yards long, has been built here in 7 to 22 feet of water. The eastern entrance to the harbor is marked by a red flagstaff, and the passage up the river for small craft is marked by three black buoys.

Lights.—A circular red lighthouse, 45 feet high, with a dwelling attached, on Knight point, about 100 yards southeastward of Souris breakwater, exhibits at 85 feet above high water, a group flashing white light, showing 1 group of 2 flashes every 5 seconds; thus, flash 0.22 second, eclipse 0.78 second, flash 0.22 second, eclipse 3.78 seconds, which should be seen, in clear weather, a distance of 15 miles.

A skeleton steel tower, 41 feet high, erected on the outer end of Souris East breakwater, exhibits at 40 feet above high water a fixed red light that should be visible in clear weather, from all points seaward, a distance of 7 miles. The tower is square, with sloping sides, painted red, surmounted by a white inclosed watch room and a red lantern.

Ice.—The harbor is usually frozen over about January 7, and the harbor ice breaks up about May 6; it is completely closed between those dates. Field ice arrives about February 1, and disappears between April 1 and May 1, its departure depending on the prevailing winds. The first vessel arrives about April 28, and the last one leaves about January 2.

Souris is a large village, whose chief industry is fishing, situated 60 miles northeastward of Charlottetown, on the eastern shore of Colville bay, where there are a wharf and three large fish-curing stores. The Roman Catholic church of the village is an excellent mark.

Communication.—The village is connected to Charlottetown by rail.

Storm signals are exhibited at Souris.

The United States is represented by a consular agent.

A shoal patch, with 10 fathoms water on it, lies southeastward $8\frac{1}{2}$ miles from Souris head.

Charlow bank, which is not marked on the chart, but was reported by fishermen in 1872, has a depth of 17 fathoms over it, and lies east-southeastward $8\frac{1}{2}$ miles from Souris on the following bearings: East point 21° , Souris head 291° . In thick weather it is a good guide.

The coast eastward of Colville bay trends northeastward. is bold and clear. except Hervey reef. which extends 800 yards from Hervey point, and has on it Shallop rock, which is always above water. Hervey point is 5 miles from Colville bay, and is the eastern point of Hervey cove, in which there are some remarkable and high sand hills. At Basin head, 1 mile farther northeastward, the cliffs terminate, and sand hills and sand beach form the coast nearly all the way to East point, a distance of about $7\frac{1}{2}$ miles. East lake is a shallow and narrow pond, within the sand bars, extending from Basin head to within 2 miles of East point, and having 2 miles from the head a narrow outlet, which is nearly dry at low water. Boats and small craft enter it for the produce of the country, which is well settled.

East point of Prince Edward island is a cliff of red sandstone 30 to 60 feet in height, from which a reef runs out 1,400 yards to the depth of 3 fathoms, and not quite 1 mile to 5 fathoms. East Point lighthouse, in line with the fog-signal building, leads approximately over the outer point of the reef. There is frequently a great rippling off East point. The depth of 20 fathoms is as near as a vessel should approach in thick weather.

Light.—A white octagonal lighthouse, 60 feet high, with a white dwelling near it, at 67 yards within the eastern extreme and 83 yards from the southern coast of East point, exhibits, at 100 feet above high water, a revolving white light, which attains its greatest brilliancy every 3 minutes, and should be seen in clear weather from the bearing of 122° through south, west, and north, to 49° , a distance of 15 miles. Latitude $46^\circ 27' 10''$ N., longitude $61^\circ 58' 10''$ W.

Fog horn.—During thick or foggy weather a steam horn gives a blast of about 5 seconds' duration every minute.

The fog-signal building is colored drab, and stands 33 yards eastward of the lighthouse.

Caution is necessary when navigating near East point, as the tidal streams are said to be influenced by strong winds and to be irregular both in rate and direction.

Anchorage southward of East point is good with northerly winds as far westward as East lake outlet, in a moderate depth of water, red sand bottom. Northward of the point the anchorage is not good, the ground being either loose or rocky.

Tides.—It is high water, full and change, at East point at 8h. 30m.; springs rise $3\frac{1}{2}$ feet, neaps 2 feet.

The tidal streams run at the rate of $2\frac{1}{2}$ knots between the northern end of Milne bank and the point, but are not nearly so strong farther westward.

The tidal streams set very strongly toward and over East Point reef; in September near the reef, the southwest-going stream made when the marks on shore indicated about half ebb and continued until about half flood, when after a short interval of slack water, the northeast-going stream commenced.

Milne bank is $5\frac{3}{4}$ miles long, north and south, and $1\frac{3}{4}$ miles broad, within the depth of 10 fathoms, the bottom being of sandstone thinly covered here and there with red sand. The soundings are irregular, between 6 and 9 fathoms over the northern part of the bank; but towards the southern end, and close to the outer edge, there is a shallow part, $1\frac{1}{2}$ miles in length, on which there are $4\frac{1}{2}$ fathoms at low water springs. This shallowest part of the bank lies between 144° , $4\frac{1}{4}$ miles and 160° , $5\frac{3}{4}$ miles from East point. Souris head and Dean point in line, bearing 157° , leads over its northern extreme in 5 fathoms; Beaton point, open northward of East point, clears it, and Swanton and Chepstow points, bearing 265° , leads just southward of it in the same depth, but all these points except East point are so distant that very clear weather is required to distinguish them.

The extreme southern end of this bank, in 10 fathoms, bears 159° , $6\frac{1}{4}$ miles from East point; and the northern extreme 88° , 2 miles. Between the northern part of the bank and East point there are 10 to $11\frac{1}{2}$ fathoms, red sand bottom, the deepest water being close to the bank. The eastern edge of the bank is steep-to, there being 12 to 15 fathoms close to it, and there is frequently a great rippling along it, caused by the abrupt opposition which it presents to the southwest flood stream. The sea is very heavy here, and also off the point, in strong northeast gales.

NORTH COAST OF PRINCE EDWARD ISLAND.

The great bay formed by the northern coast of Prince Edward island is 91 miles wide and 22 miles deep, and it is very difficult to beat a ship out of it in the heavy and long-continued northeast gales, which frequently occur toward the fall of the year. This difficulty seems to be caused either by an acceleration in the rate of the current that so frequently runs past cape Gaspé, Bonaventure island, and Miscou banks, and doubtless continues farther southward; or by an extension of the general southerly set so often experienced between Bird island and Anticosti or cape Rosier, and which increases in strong northeast winds.

Tides and tidal streams.—The lateral wave extending off the tidal undulation which passes southward of Anticosti, turns toward Chaleur bay and Miramichi, then passing southeastward along the north coast of Prince Edward, and causing the time of high water at

full and change to become later in succession, in proceeding from North point to Cascumpeque, Malpeque, Grenville bay, Rustico, Tracadie, and toward East point.

The set of the tidal streams may be very unfavorable to a vessel endeavoring to work out of the bay, for the flood stream sets southward into it, in conformity with the progress of the reflux tide wave, from North point southeastward to St. Peter, while farther eastward the flood or southwest-going stream, which comes from between Magdalen islands and Cape Breton island, also sets toward the shore, especially near East point.

The ebb streams appear to set in the opposite directions.

The tidal streams meet and separate northward of St. Peter harbor.

Anchorage.—With the exception of a few places off the bars of the harbors, the anchorage is, generally speaking, very bad all along the northern coast of the island, the bottom being red sandstone, thinly covered occasionally with sand, gravel, and broken shells.

Harbors.—The harbors all have narrow entrances between sand bars, with dangerous shoals of sand at various distances from the shore. They are suitable only for small vessels, with the exception of Malpeque bay and Cascumpeque, and even those could not be safely approached in bad weather and with a heavy sea, when the breakers on their bars extend quite across, leaving no visible channel. Besides the coasting vessels calling for produce, these harbors are frequently visited by American schooners requiring wood and water, or shelter on the approach of bad weather.

The coast from East point to St. Peter harbor, a distance of 33 miles westward, is unbroken, and formed of red sandstone cliffs, with occasional patches of sandy beach at the mouths of small streams, where boats can land only in fine weather or with offshore winds. Surveyor pond, 4 miles from East point, is closed with sand. At Surveyor pond there are high sand hills, after which there are none until the beginning of the magnificent range of sand hills which continues westward for several miles to St. Peter harbor, near the entrance of which it attains a height of 70 feet.

Shallow water does not extend beyond $\frac{1}{2}$ mile anywhere off this coast, and there are in general 10 fathoms within 1 mile of the land, the bottom being sandstone and the anchorage bad.

Campbell cove, on the northern coast of the island about 8 miles from East point, has a breakwater on its western side, which shelters a small area carrying a depth of 4 feet at low water. This place is much used in the farming and fishing industries of the district.

St. Peter harbor, usually called St. Peter bay, is of great extent, running in east-southeastward 7 miles, with a depth in places of 3 fathoms, but it is suitable only for small vessels, as there is a depth

of only 5 feet over its bar of sand at low water. The outer edge of the bar, in 3 fathoms, is only 1,400 yards from the shore.

On the western side of the entrance there is a breakwater, 226 feet long, having its inner end connected with high ground by a beach-protection work 1,420 feet long.

The range lighthouses in line lead over the bar in a depth of about 5 feet.

The best channel is marked by buoys. The channel is liable to shift in heavy gales, and there is a sharp turn to the eastward immediately within the entrance; it is a very dangerous place, and no attempt must be made to enter it by strangers, and even by those having local knowledge only in fine weather.

Morrell river enters the southwestern side of this harbor 3 miles within the entrance, and is navigable for boats for 3 miles inland. Several smaller streams enter the harbor on the same side, and St. Peter river enters its head; all these are mere brooks at the head of the tide.

The shores of the harbor are well settled, and there is a church on the eastern shore near the head of the harbor and another with a white steeple to the westward.

In 1901 the population of the town was 1,168.

There is a railway station at St. Peter.

Range lights.—A square, white lighthouse, 35 feet high, at 40 feet from the outer end of the breakwater on the western side of the channel to St. Peter harbor, exhibits at 34 feet above high water a fixed white light, which should be seen in clear weather a distance of 6 miles.

A square, white lighthouse, 33 feet high, on the sand beach at $167^{\circ} 486$ yards from the preceding lighthouse, exhibits at 32 feet above high water a fixed white light which should be seen in clear weather a distance of 6 miles.

This, the inner, light is shifted as the bar alters; and the lights in line lead over the bar in a depth of about 5 feet.

Tides.—It is high water, full and change, in St. Peter harbor at 6h. 30m. approximately; springs rise 4 feet, neaps $2\frac{1}{2}$ feet. The rate of the tidal streams in the narrow entrance to St. Peter harbor is nearly 3 knots, and at times the ebb reaches 4 knots.

Savage harbor, 3 miles farther westward, has 5 feet at low water over its bar; as the tidal rise is 2 to 3 feet, it is suitable only for fishing boats or very small craft. The church here is a good landmark. Just westward of its entrance there is some shallow water of $4\frac{1}{4}$ fathoms, rock bottom, nearly $1\frac{1}{2}$ miles from the shore. The distance across from the head of this harbor, which runs inland 3 miles, to the head of Hillsborough river is less than 1 mile, and there is a road between

Range lights.—A mast, 20 feet high, with a brown shed at its base, on McEachern's farm near the western edge of the inner shore of the harbor, exhibits at 22 feet above high water a fixed white light that should be seen in clear weather a distance of 5 miles. This light is liable to be moved to suit the changes in the channel.

A mast, 25 feet high, with a brown shed at its base, and situated 150°, 110 yards from the preceding light, exhibits at 30 feet above high water a fixed white light that should be seen in clear weather a distance of 5 miles.

Directions.—The lightmasts in line leads to a black and white striped buoy moored in mid-channel and in 12 feet water just outside the bar. Pass this buoy and open the lightmasts about a point on the starboard bow, until the inner fairway buoy is reached, when leave the range and steer about 100° for $\frac{1}{4}$ mile and then steer directly for the outer light, to the fishing stakes.

Tracadie harbor, or Bedford bay, 9 miles westward of Savage harbor, has its entrance at the western end of a remarkable range of sand hills 50 or 60 feet high. The bar of sand, which shifts occasionally in heavy gales, extends $\frac{3}{4}$ mile from the entrance, and has a depth of 5 feet over it at low water, in a channel only 80 yards wide. The place, therefore, is suitable only for small vessels, and favorable weather is necessary for them to take the bar with safety. The harbor is 3 miles wide within the sand bar, and carries $2\frac{1}{2}$ fathoms water; it runs in 4 miles to the southward, and sends off to the westward a branch called Winter creek. The head of the harbor approaches to $1\frac{1}{2}$ miles from Hillsborough river, to which there is a good road.

There is a railway station at Tracadie, but it is about 5 miles within the entrance.

Range lights.—A brown square open framework lighthouse, 22 feet high, with a white lantern, on the beach on the western side of Tracadie harbor entrance, and 600 yards within the shore-line, exhibits, at 19 feet above high water, a fixed red light which should be seen in clear weather a distance of 8 miles.

A square white lighthouse, 26 feet high, situated 179°, 400 yards from the preceding lighthouse, exhibits, at 24 feet above high water, a fixed red light, which should be seen in clear weather a distance of 8 miles.

The towers are moved as the channel shifts.

Tides.—It is high water, full and change, at the entrance of Tracadie harbor at 7h. 0m.; springs rise $3\frac{1}{2}$ feet, neaps 2 feet; but the level of the water varies according to the directions of the wind. The rate of the tidal streams in the entrance is about 2 knots.

Directions.—The lights in line lead past the buoys, leaving the buoy outside the bar on the starboard hand, the buoy inside the bar

on the port hand, and the red spar buoy on the western bend of the channel on the starboard hand.

The channel is intricate and liable to change, consequently it must not be attempted without recent local knowledge, nor with onshore winds.

Cape Stanhope, on which there is a sand hill 30 feet high, is about $4\frac{1}{4}$ miles west-northwestward of Tracadie harbor entrance; it has a reef running out $\frac{3}{4}$ mile from it to the depth of 3 fathoms, and 1 mile to 5 fathoms; on parts of this reef there is only 1 foot of water $\frac{1}{2}$ mile from the shore.

The coast between cape Stanhope and cape Turner, 9 miles west-northwestward forms a curve or bay, where the 3 fathoms edge of shallow water is seldom less than $\frac{3}{4}$ mile offshore, and in which are the entrances of Rustico harbors. Outside the shallow water the holding ground is bad, being red sandstone, with an occasional thin covering of sand.

Cove head bay is about $\frac{1}{2}$ mile westward of cape Stanhope, and within its entrance, which at low water is about 250 feet wide, the bay is about 4 miles in length, and from $\frac{1}{2}$ mile to 1 mile in width. It receives the waters of Black river, and of Mill, Aulds and McCallums creeks. The bay is navigable over most of its extent for small vessels, but the depth on the outer bar is only $3\frac{1}{2}$ feet at low water. The harbor proper commences immediately inside the entrance, and extends westward between the sand beach and what was an extensive sand flat, dry at about half tide.

Range lights.—A lantern on a mast, 17 feet high, on the sand beach at the entrance of Cove head bay, exhibits, at 18 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 3 miles.

A lantern on a mast, 27 feet high, 200 yards south-southwestward of the preceding light, exhibits, at 25 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 3 miles.

The back light is moved to suit the changes in the channel: and the lights in line lead over the bar.

Rustico harbors have two narrow sandy entrances, one on each side of McAuslin island, and situated 4 and $6\frac{1}{2}$ miles, respectively, westward of cape Stanhope. They are suitable only for small vessels, because their shifting bars of sand are extremely dangerous, having a depth varying from 4 to 8 feet, and extending out $\frac{3}{4}$ mile from the shore to the depth of 3 fathoms at low water. The line of deepest water over each of these bars is pointed out by two buoys, the positions of which are changed as required.

Wheatley and Hunter rivers, which are navigable for boats to the distance of 5 miles inland, and Winter creek lying between them, run

into this shallow place, which extends 4 miles along the coast within the sand bars of Brackley point and McAuslin island.

There are extensive settlements on the shores of these harbors of Acadians and others, and there are two churches with steeples on the western side of Winter creek; from the eastward these churches do not open out till near the harbor, which may be recognized by some remarkable hummocks in its vicinity.

South or Little Rustico harbor is situated within the entrance at the eastern end of McAuslin island. There is a pier near the mouth of Wheatley river.

North or Grand Rustico harbor, the entrance of which is at the western end of McAuslin island, is one of the most important fishing stations on Prince Edward island. In order to improve the channel, works have been constructed on each side of the entrance, and there is now a depth of 8 feet at low water on the bar. Most of the fishing houses and stages are situated on the inner low beach.

Main light.—A square white lighthouse, 35 feet high, with a dwelling attached, on the beach inside the breakwater at Grand Rustico, exhibits at 36 feet above high water a fixed white light, which should be seen from seaward, in clear weather, a distance of 8 miles.

Range lights.—A lantern on a mast, 20 feet high, on the edge of the pilework on the western side of the harbor entrance, exhibits at 22 feet above high water a fixed red light, visible on the range line, in clear weather, a distance of 5 miles.

A lantern on a mast, 38 feet high, 121° , 102 yards from the preceding light, exhibits, at 40 feet above high water, a fixed red light, visible on the range line, in clear weather, a distance of 5 miles.

The positions of the masts are subject to alteration to suit the channel; and the lights in line lead over the bar in the deepest water.

Beacon.—A white mast, 25 feet high, with a diamond-shaped slatted beacon at its head, on the outer end of the breakwater, indicates the position of the latter, but it can not be otherwise used as a guide.

Tides.—It is high water, full and change, in Grand Rustico harbor at 6h. 40m.; springs rise 4 feet, neaps 2 feet. The rate of the tidal streams in the entrance is 2 knots.

Directions.—The two light masts, or their red lights, in line 121° , lead over the bar outside the mouth of the harbor in the deepest water and clear of the breakwater. Local knowledge is necessary.

Cape Turner, $2\frac{3}{4}$ miles north-northwestward of Grand Rustico harbor entrance, is 120 feet high, of red sandstone and conglomerate, being the highest cliff on the island.

Tides.—It is high water, full and change, at cape Turner at 6h. 10m.; springs rise 4 feet, neaps 2 feet.

Grenville or New London harbor entrance is $6\frac{3}{4}$ miles westward from cape Turner, and at the northwestern end of a long range of sand hills, the highest of which is 55 feet above high water. The entrance is about 400 yards wide, but the harbor is about 3 miles long and nearly as wide; it receives the waters of Hope, Southwest, Stanley, and French rivers, all of which are navigable for short distances, and have wharf accommodation from which large quantities of farm produce are exported; the districts around the harbor being well cultivated and very productive. The harbor is largely used as a harbor of refuge and also as a fishing station, the fishing grounds in the vicinity being considered the best in the gulf of St. Lawrence.

The entrance is obstructed by a shifting sand bar, and breakwaters or beach protection works have been constructed on each side in order to preserve the beaches and increase the scour across the sand-bar. The depth of water was $9\frac{1}{2}$ feet over the bar in 1904, and is 6 feet in the harbor, at low water. The bar extends out 1,400 yards from the entrance, and shallow water extends out one mile, at which distance there are 5 fathoms over sand bottom.

New London, where the English church, having a steeple, and the Scotch church are situated, on the western shore $1\frac{1}{2}$ miles within the entrance, is the chief settlement.

Range lights.—A square white lighthouse with a brown lantern, 35 feet high, and with a dwelling attached, on the beach at the western side of Grenville harbor entrance, exhibits, at 45 feet above high water, a fixed red light, which should be seen seaward, in clear weather, a distance of 7 miles. This lighthouse is 500 yards 202° from the following range lighthouse, and is a coast light.

A square white lighthouse on a brown framework, 21 feet high, on the outer end of the breakwater on the northwestern side of Grenville harbor, exhibits, at 24 feet above high water, a fixed white light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line, a distance of 10 miles.

This range light is changed to suit alterations in the channel and the lights in line lead over the bar.

Tides.—It is high water, full and change, in Grenville harbor at 6h. 10m. by the mean of the a. m. and p. m. tides; the a. m. tide being the earlier and higher during summer; springs rise $3\frac{1}{2}$ feet, neaps 2 feet; easterly winds raise the level of the water.

Directions.—No attempt should be made to enter the harbor without a pilot, except by those possessing local knowledge. Buoys at the entrance of the harbor mark the channel and indicate the best

water into the harbor during daylight. The lights in line, bearing 202° , lead over the bar in past Simms point.

Cape Tryon, $1\frac{1}{2}$ miles northwestward of Grenville harbor entrance, is a remarkable cliff of red sandstone, rising to the height of 110 feet.

Light.—A white rectangular building, with a red octagonal lantern on the northern part of its roof, 37 feet high, and situated on the extremity of cape Tryon, exhibits, at 106 feet above high water, a flashing white light, giving 1 bright flash of 0.64 second duration, every 5 seconds, thus, flash 0.64 second, eclipse 4.36 seconds, which should be seen in all directions seaward, in clear weather, a distance of 16 miles.

The coast from cape Tryon to cape Aylesbury, which bears 287° , 7 miles from it, is nearly straight and unbroken; but shallow water runs out a considerable distance, and it should not be closed to a depth less than 7 fathoms.

Malpeque bay, the principal entrance to which is between cape Aylesbury and Billhook island, $1\frac{1}{2}$ miles west-northwestward, is of great extent, running across the island to within $2\frac{1}{2}$ miles of Bedeque harbor, and also west-northwestward for the distance of 10 miles. It contains seven islands and a great number of creeks or rivers, some of which are navigable by vessels of considerable size, and all of them by small craft and boats. Grand river, the chief of these inlets, can be ascended $7\frac{1}{2}$ miles by boats. There is a depth of 12 feet at low water springs over the outer bar, situated about a mile northward of cape Aylesbury.

Malpeque harbor.—The principal entrance, or Ship channel, to the bay is southward of Billhook or Fish island, and between it and Royalty sand, which dries out $\frac{1}{2}$ mile from Royalty point. The Ship channel is southeastward of all the sand bars, including Billhook island, and between them and the red sandstone cliffs of cape Aylesbury. The ground is good in Malpeque harbor, which is the usual anchorage and situated just within this entrance, where there is space and depth enough for a large number of vessels, the bar outside preventing any sea from coming in, and Horseshoe shoals sheltering it from westerly winds down the bay.

West gully, the entrance northwestward of Billhook island, is so narrow and intricate as to be suitable only for boats, or very small craft, although it has a depth of 9 feet over its dangerous bar of sand, which is $1\frac{1}{4}$ miles out from the shore.

Darnley Point range lights.—A square white open framed light-house, slatted, facing line of range, 25 feet high, near the coast at 1,250 yards east-southeastward of cape Aylesbury, exhibits, at 40 feet above high water, a fixed red light.

A similar lighthouse 191° , 447 yards from the preceding lighthouse, exhibits, at 65 feet above high water, a fixed red light.

These lights are visible over an arc of $22\frac{1}{2}^{\circ}$ on each side of their alignment and also over the north bar to the west-northwestward, and should be seen, in clear weather, a distance of 7 miles, but their power decreases as the line of range is departed from.

The lights in line 191° lead to the black can buoy in the ship channel on the bar, where this range line intersects that of the Fish Island range lights.

Fish Island range lights.—A white open framed lighthouse, 22 feet high, on the southeastern end of Billhook or Fish island, exhibits, at 18 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 6 miles.

A square white lighthouse, 46 feet high, with dwelling attached, on Billhook island, at 275° , 400 yards from the preceding lighthouse, and on the northern side of entrance to Malpeque harbor, exhibits, at 50 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 12 miles. This light is a coast light.

These lights in line and ranging with the fairway buoy inside the bar lead from the intersection of their range line with that of the Darnley Point range, over the bar in 15 feet, to the fairway buoy inside the bar, whence the channel is marked by the harbor buoys.

Darnley Basin range lights.—A white open framed lighthouse, 15 feet high, on the western shore of Darnley basin, exhibits, at 55 feet above high water, a fixed green light, which should be seen, in clear weather, a distance of 3 miles.

A similar lighthouse, 21 feet high, situated 168° , 120 yards from the preceding lighthouse, exhibits, at 64 feet above high water, a fixed green light, which should be seen, in clear weather, a distance of 3 miles.

These lights are visible in the direction of their alignment and should be seen, in clear weather, a distance of 3 miles. They lead into Darnley basin, but strangers should not attempt the entrance.

Buoys.—A black can buoy is moored southeastward of the bar with the lighthouses southeastward of cape Aylesbury in line. There is a fairway buoy inside the bar, whence the channel is marked by buoys.

Ice.—Malpeque bay is usually frozen over about the middle of December, and the ice in the bay breaks up about April 1; at that time field ice drives this ice back, and the bay is not clear until May 1. The first vessel arrives about the middle of May, and the last one leaves about the middle of December.

The bar of the Ship channel runs out about 79° nearly 2 miles from Billhook island, and then turns southward to the shore eastward

of cape Aylesbury. It is sandstone thinly and unevenly covered with sand, but the rock in many places is quite bare; therefore, it is exceedingly dangerous in bad weather, when all signs of a channel are obliterated by heavy breakers. The northern part of the bar for $1\frac{1}{2}$ miles out eastward from Billhook island, is very shallow, there being some patches of only 4 feet at low water; but Malpeque church and Darnley point in line, bearing 191° , leads southeastward of this shallow part.

The narrowest part of the ship channel just within, or westward of the above mark, is 200 yards wide, and carries 3 to 4 fathoms water, but there is a 13-foot patch between the outer and inner bars. The inner bar, of sandstone and with 19 feet at low water, is $\frac{1}{4}$ mile further in, and there is usually a fairway buoy upon it.

Anchorage.—There is temporary anchorage outside the bar, in 5 to 7 fathoms, sand bottom; and should the wind or tide fail, the anchorage between the inner bar and the entrance is considered tolerably safe with any wind that would prevent a sailing vessel from running in, but the holding ground is not good there, and must not be trusted except in fine summer weather. Within Malpeque harbor, at the anchorage, where the deepest water is off the northern end of Royalty sand, the bottom is sand and clay in 3 to 10 fathoms.

Tides.—It is high water, full and change, in Malpeque harbor at 6h. 0m.; springs rise 3 feet, neaps 2 feet, but the rise is irregular, and a rise of 2 feet is all that can be depended on. Northeasterly winds raise the level of the water; westerly winds lower it. The a. m. tides are the highest in summer. The tidal streams are strongest in the entrance and off Royalty sand, where they attain a rate of $2\frac{1}{2}$ knots at springs; in Ship channel, from the entrance to the inner bar, the rate is $1\frac{1}{2}$ to 2 knots. Within the bay the streams are usually much weaker and seldom reach 1 knot.

Directions.—The bar has shifted since it was surveyed, and the chart and the buoys are not to be depended on; no attempt should be made to cross the bar without a pilot, or without an examination of the bar if a pilot can not be obtained. To enter, bring the lighthouses southeastward of cape Aylesbury in line, 191° , while outside the bar, and keep this range on until Billhook Island or Fish Island lighthouses are in line, 275° , when the vessel will be near the outer bar buoy. Keep Billhook Island lighthouses in line as far as the inner fairway buoy, above which the channel is marked by harbor buoys.

Local knowledge is required to enter Darnley basin.

Settlements.—Malpeque, on the neck of land between Darnley basin and March water, and southward 2 miles from Darnley point, is one of the oldest settlements on the island; its church, to the east-

ward of which there is a Roman Catholic college with two spires, is an excellent mark.

There are fine settlements at Grand river, and also at Port Hill, in the northwestern part of the bay within Lennox island, upon which there is an Indian church and settlement, but they are not visible from the sea. There are also large settlements at the head of the bay, where St. Eleanor and Miscouche churches are on the ridge which separates the bay from Northumberland strait.

Supplies.—Fresh provisions can be obtained at Malpeque; but considerable time is required to obtain a quantity of water, as it is procured from wells.

The coast from the southeastern end of Billhook island to Cascumpeque harbor entrance, which is $19\frac{1}{2}$ miles northwestward, is formed of sand bars and sand beaches, from which shallow water extends about $\frac{2}{3}$ mile to 3 fathoms, and 1 mile to 5 fathoms. Between Billhook island and Cascumpeque harbor there are two openings through the sand bars, Conway and Cavendish inlets, which afford shelter to boats, and are distant 9 miles and 13 miles, respectively, from the southeastern end of Billhook island.

Boats can enter Malpeque bay by Conway inlet, passing westward of Lennox island at high water.

Little Channel range lights.—Two fixed white range lights are exhibited, at 26 and 16 feet above high water, from white lighthouses, the front one open framework, 30 and 20 feet high, and 66 yards apart, on the northwestern side of Conway inlet entrance, which should be seen in clear weather distances of 10 and 8 miles. The position of the outer light is altered to meet changes in the channel.

NOTE.—These lighthouses in line lead through the channel, in 5 feet water; but there is a ballast heap in their alignment at the point of the southern sand hill, to pass which the front light must be opened to the northward.

Cascumpeque bay, within the sand bars, is of great extent and broken into inlets or rivers, which penetrate the country in several directions and for many miles. At high water there are boat channels southward to Malpeque bay and northward to Kildare river. Cascumpeque narrows, a shallow stretch of water, $\frac{1}{2}$ mile to 1 mile in width, lying between the sand dunes and the sand bars that extend nearly parallel with the coast of the island, connects Malpeque and Cascumpeque bays.

There is an entrance into the bay, which has 5 feet over its bar, about 2 miles southward of the harbor entrance, for which it can not be mistaken because of its nearness to the high sand hills and the absence of a lighthouse, but there is shoal water inside it.

Cascumpeque harbor, which is much used as a harbor of refuge by coasters and fishermen, is of considerable extent, with a good depth of water, and sheltered from all winds: but its approach is obstructed by an outlying and shifting sand bar.

A ridge of remarkable sand hills, 50 feet high, forms the coast $3\frac{1}{2}$ miles southward of its entrance.

The entrance to the harbor is 375 yards wide, between two sand bars resting upon sandstone, which forms the inner bar, over which there are 10 feet at low water. The outer bar, of sand, lying $1\frac{1}{4}$ miles out from the entrance, usually has, at its best, a depth of only 10 feet at low water, in a very narrow channel; and even this depth is sometimes reduced, possibly owing to breaches that occur in the sand beaches. In easterly gales the bar is covered with continuous heavy breakers.

The channel, from the outer to the inner bar, is 200 yards wide, between sand banks covered by only a few feet of water, and which at the entrance are dry at low water. Within the entrance the harbor has plenty of water and a clear channel, which, after running in west-southwestward 1 mile, turns southward behind Savage island.

From 1 to 3 miles from the entrance of the harbor breaches have recently occurred in the beaches, and injury to the harbor is feared: and it is doubtful if permanent closing of the breaches is possible without very extensive works of protection.

Light.—A square white lighthouse, 46 feet high, with a dwelling attached, on the inner face of the sand hills on the southern side of Cascumpeque harbor entrance, exhibits, at 48 feet above high water, a fixed white light, which should be seen, in clear weather, from all directions a distance of 12 miles.

Sandy Island range lights.—A square white lighthouse, 22 feet high, on the southeastern side of Sandy island, exhibits, at 20 feet above high water, a fixed white light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line a distance of 9 miles.

A square white open framed tower, slatted toward channel, 26 feet high, 263° , 120 yards from the preceding lighthouse, exhibits, at 24 feet above high water, a fixed white light, which should be seen in clear weather, on, and over a small arc on each side of, the range line a distance of 10 miles. These lights in line lead from the bar to the intersection of their range line with that of the Northport lights.

Northport range lights.—A square white lighthouse, 29 feet high, at Northport, on the bank 170 yards westward of the railway wharf, exhibits, at 31 feet above high water, a fixed red light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line a distance of 3 miles.

A square white lighthouse, 41 feet high, at 250° , 375 yards from the preceding light, exhibits, at 42 feet above high water, a fixed red light, which should be seen, in clear weather, on, and over a small arc on each side of, the range line a distance of 3 miles. These lights in line lead from the intersection of their range line with that of Sandy Island range lights, directly up the harbor.

Buoy.—A conical red buoy is moored in 29 feet water off the outer bar at the entrance to Cascumpeque harbor, with the lighthouse on the southern side of the entrance bearing 247° , distant $1\frac{1}{2}$ miles nearly. The buoy bears the word "Cascumpeque" in white letters.

Tides.—It is high water, full and change, in Cascumpeque harbor at 5h. 40m.; springs rise 3 feet, neaps 2 feet, but the tidal rise is irregular; and therefore 13 feet on the bar is all that can be safely reckoned on except in strong easterly winds which raise the level of the water a foot or more in this harbor, as they do in all the harbors of this coast.

Caution.—The rate of the tidal streams in the entrance of Cascumpeque harbor is usually $1\frac{1}{2}$ knots, but it frequently is over 4 knots.

Ice.—The harbor is usually frozen over about January 3, and is clear of harbor ice about April 6, being completely closed between those dates; field ice drifts in about January 4, and disappears about May 10. The first vessel arrives about April 28, and the last leaves about December 20.

Anchorage.—There is good anchorage off the bar in fine weather in 6 fathoms, sand; and tolerable anchorage in the channel between the outer and inner bars in $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms, sand. There is good anchorage in the channel within the entrance in about 3 to 5 fathoms.

Directions.—The channel over the bar constantly shifts, and no attempt must be made to enter without a pilot, except by those possessing recent local knowledge. To enter at present, approach with the main lighthouse on the southern side of the harbor entrance, or its light, bearing 253° , until the range lighthouses or their lights on Sandy island are in line 263° . Keep this range on and steer over the bar in 10 feet water, until the range lighthouses or their lights at Northport are in line, which range leads directly up the harbor.

Caution.—Care must be taken not to overrun the line of the Northport range, as its intersection, with that of the Sandy Island range, is very close to the shoal off Kildare point.

Alberton, a small town, rising in importance, is situated on the northern shore of Cascumpeque harbor. The churches, courthouse, and buildings generally are of wood and painted white.

There is a station of the Prince Edward Island railway here, which has a branch to the deep water wharf, with sidings, freight house,

etc., on the shore of the harbor, whence an extensive traffic is carried on during seasons of shipment.

Northport lies southward of Alberton.

The coast from Cascumpeque harbor entrance trends north-northeastward 5 miles to cape Kildare, and thence northward 11 miles to North point. Along this coast there are no high sand hills nor other prominent features northeastward of Cascumpeque harbor.

Generally there are rocky and irregular soundings of 3 to 5 fathoms, all along this coast, frequently extending nearly 2 miles off-shore. Shallow water extends 1.4 miles off cape Kildare, which is a cliff of red sandstone 30 feet high, having the land about it red and surmounted by clumps of trees, and about a mile northward of Tignish river entrance a rocky ledge with only 3 fathoms on it at low water runs off to the distance of 1.3 miles.

Tignish harbor, affording shelter to fishing boats, is at the mouth of Tignish river, which flows into the sea $4\frac{1}{2}$ miles northward of cape Kildare. On each side of the mouth of the river the coast is quite straight for a long distance and gales from northeast to southeast throw in a very heavy sea, which acting on the sand beaches frequently causes the entrance to be completely closed, until it is broken through on the occasion of a freshet or an unusually high tide. Works have been constructed on each side of the river's mouth, contracting it to the width of 40 yards, with the effect of increasing the current and giving a better depth of water.

At Tignish, situated about 1 mile inland from the river entrance, there is a fishing village, with two churches, a new one of brick standing 1 mile eastward of the other, and forming with its spire one of the best landmarks in the vicinity, visible from both sides of the island.

Lights.—A square lighthouse, 33 feet high, painted white with a black horizontal band, on the beach at the inner end of the northern breakwater pier, exhibits, at 35 feet above high water, a fixed white light, which should be seen in clear weather a distance of 11 miles.

A mast, 14 feet high, with a white shed at its base, on the outer end of the northern breakwater pier, and 107° , 207 yards from the preceding lighthouse, exhibits, at 18 feet above high water, a fixed red light, which should be seen in clear weather a distance of 5 miles.

The lights in line 107° lead in between the breakwaters. The outer light also shows the end of the pier and is for the convenience of small vessels only.

Storm signals are exhibited at Tignish.

CHAPTER VI.

PROVINCES OF NEW BRUNSWICK AND QUEBEC—GULF OF ST. LAWRENCE, WEST SHORE—MIRAMICHI BAY TO GASPÉ BAY—ESCUMINAC POINT TO CAPE GASPÉ—CHALEURS BAY.

VARIATION IN 1908.

Escuminac point	-----	23° 25' W.	Birch point	-----	24° 37' W.
Tracadie South gully	-----	24° 00' W.	Cape Gaspé	-----	25° 25' W.
Dalhousie, bay of Chaleurs		--	23° 30' W.		

NEW BRUNSWICK.

The coast.—The lighthouse on Birch point, Miscou island, entrance to Chaleurs bay, bears approximately 17° , distant 57 miles from the lighthouse on Escuminac point. The intermediate coast is low and wooded, with sand bars and beaches, often inclosing shallow lagoons, through which the rivers flow into the sea. The entrances of these lagoons and rivers through the sand bars, which are usually termed gullies locally, are generally difficult to reach, because of the shifting bars of sand off their mouths. They all afford shelter to boats, and some of them to small craft, but the only harbor for shipping is at Miramichi.

As there are no detached shoals off this coast, it may be safely approached to 10 fathoms water at night, and to 6 fathoms by day. Nevertheless, caution must be observed because shoal water extends a considerable distance from the shore in several places.

Escuminac point, the southeastern point of Miramichi bay, is of peat, upon a very low sandstone cliff, and wooded with spruce trees, which form a very dark ground for the white lighthouse on it, rendering it very conspicuous. Strangers have great difficulty in distinguishing one point of this low coast from another, and the lighthouse is a most useful landmark.

Light.—An octagonal white tower, 69 feet high, with a dwelling near it, on Escuminac point, exhibits, at 70 feet above high water, a fixed white light, which should be seen in clear weather a distance of 14 miles.

Fog signal.—A diaphone trumpet, operated by compressed air, situated in a building 80 yards northwestward of the lighthouse, gives 1 blast of 4 seconds' duration, every 41 seconds, in thick or

foggy weather. The fog-signal building has a high brick chimney, and is painted white, with a red roof.

Signal station.—There is a telegraph and signal station at the lighthouse.

Storm signals are exhibited at Escuminac point.

Escuminac reef extends north-northeastward 2 miles from the lighthouse to the depth of 3 fathoms, and $2\frac{3}{4}$ miles to 5 fathoms at low water.

Buoy.—A black can buoy is moored in 5 fathoms water on the outer edge of the shoal ground off Escuminac point, with Escuminac lighthouse bearing 200° , distant $2\frac{1}{4}$ miles.

Miramichi bay is nearly 14 miles wide from Escuminac point to the sand bars of Blackland point, and $6\frac{1}{2}$ miles deep from the line across its mouth between those points to the main entrance of the Miramichi river, between Portage and Fox islands. The bay is formed by a semicircular range of low sandy islands, between which there are three small passages and one main or ship channel, leading into the inner bay or estuary of the Miramichi river.

The southern shore of the bay from Escuminac point trends westward $6\frac{1}{4}$ miles to Huckleberry gully, and is low.

Several lobster factories have been built between Escuminac point and Escuminac village, the most conspicuous being at Herring cove and Winter portage, distant 1 and 2 miles, respectively, from Escuminac lighthouse.

The Roman Catholic church, westward of Escuminac village, has a square tower, and is conspicuous from the northeastward viewed from northward of Escuminac point.

Telegraph station.—There is a telegraph station at Escuminac village about $3\frac{1}{2}$ miles westward of Escuminac point.

Lights—Preston Beach range.—A square white tower with a red lantern, 29 feet high, on Preston beach about 5 miles westward of Escuminac point, exhibits, at 47 feet above high water, a fixed white light, which should be seen in clear weather a distance of 10 miles.

A red skeleton tower, the upper part of which is inclosed, and painted white, 58 feet high, with red lantern, situated 139° , 268 yards from the preceding lighthouse, exhibits at 59 feet above high water a fixed white light, which should be seen in clear weather a distance of 10 miles.

The lights in line lead from Bar buoy through ship channel eastward of Lump buoy, and of course form a back range.

Huckleberry island is 33 feet above high water and 1 mile long, west-northwest and east-southeast.

Huckleberry gully, between the mainland and the island, and Fox gully, between Huckleberry and Fox islands, are almost dry at low

water, Fox gully being difficult to distinguish. They are both suitable only for boats or very small craft, and the channels leading westward from them, up a branch of the main bay within Huckleberry island, or across to French river and village (where there is a wooden church somewhat resembling a barn in appearance), are narrow and intricate, between flats of sand, mud, and eel grass, with sufficient water only for boats.

Buoy.—A red can buoy is moored in $1\frac{1}{2}$ fathoms water on the northwestern side of the entrance to Huckleberry gully, with the southeastern point of Huckleberry island bearing 236° , distant 1,200 yards.

Fox island is $3\frac{3}{4}$ miles long, northwest and southeast, narrow and partly wooded; its surface is composed of parallel ridges of sand hills, which contain imbedded drift timber. Since 1857 the northern part of the island has been washing away.

Lights—Swashway range.—Two white square skeleton wood towers, with horizontal slatwork seawards, are erected on Fox island.

The front tower, 46 feet high, $1\frac{1}{2}$ miles from the southern end of the island, on ground 6 feet above the sea and 100 feet back from the eastern coast, exhibits, at 47 feet above high water, a fixed white light, which should be seen in clear weather, on, and over a small arc on each side of, the range line, a distance of 12 miles.

The back tower, 71 feet high, at 260° , 407 yards from the front light, exhibits, at 72 feet above high water, a fixed white light, which should be seen in clear weather, on, and over a small arc on each side of, the range line, a distance of 14 miles.

The lights in line 260° lead from the outer bay through the swashway, in not less than $2\frac{3}{4}$ fathoms water, to the buoys in ship channel.

At the northwestern part of Fox island three fixed white lights are exhibited from three white masts, 40, 38, and 28 feet high, with white sheds at their bases. White day marks are attached to the masts. The lights should be seen in clear weather a distance of 8 miles.

No. 1 light is 610 yards from the northwest point of the island and 47 feet above high water.

No. 2 light is 118° , 350 yards from No. 1 and 46 feet above high water.

No. 3 light is 222° , 318 yards from No. 1 and 36 feet above high water.

Nos. 1 and 2 lights in line, back range 118° , lead into Old Horse-shoe channel.

Nos. 1 and 3 lights in line, 222° , lead through Portage Island channel.

Nos. 2 and 3 lights in line, back range 83° , lead to the upper buoy of Horseshoe shoal.

Portage island is $4\frac{1}{2}$ miles long, north and south, narrow, low, and partly wooded with small spruce trees and bushes. From a distance the island shows in three parts, composed of clumps of trees 61 feet high, with marshes between. There are several conspicuous houses on the island; the most prominent, a lobster factory, with dwellings attached, is on the eastern coast, about $1\frac{1}{2}$ miles from the southern end of the island; a similar group of buildings is on the western coast, at the same distance from the northern end.

Fox and Portage islands are merely sand bars on a large scale, and are not more than 50 feet above the sea; though they are incapable of agricultural cultivation, yet they are covered with plants and shrubs suited to the locality, and wild fruits, such as the blueberry, strawberry, and raspberry. Wild fowl of various kinds are plentiful in their season, and so also are salmon, which are taken in nets and weirs along the beaches outside the islands, as well as in the gullies.

Light.—A square white lighthouse, 42 feet high, with a dwelling near it, on the southern end of Portage island, exhibits, at 45 feet above high water, a fixed white light, which should be seen in clear weather a distance of 12 miles.

Fog signal.—A hand horn answers vessels' signals.

Miramichi bar commences at the southeastern end of Portage island, and extends across the main entrance of the bay parallel to Fox island, or nearly 6 miles in a southeasterly direction. It consists of sand and has a depth of only 1 or 2 feet water over it in some parts at low water springs. Near Portage island it has sufficient water over it for small vessels, and in the Swashway, near its southeastern end, deeper water of $2\frac{3}{4}$ fathoms.

Lump shoal is the southern part, and Spit shoal the northeastern part, of the shoal water extending eastward of Fox island; both are steep, but between them a vessel may run along or even work on the southwestern side of the channel in 4 to 3 fathoms by the lead.

On the northeastern side of the channel the bar is extremely steep.

The ship channel passes around the southern end of the bar in a least depth of $3\frac{1}{4}$ fathoms.

Horseshoe shoal, westward of Portage island, is sand and gravel and of great extent; the least water on it is 3 feet, and it is separated from the shoal on the inner side of Portage island by a narrow and intricate channel, which is seldom used.

Horseshoe or Inner bar.—On the southern side of the bay Horseshoe shoal is separated from the shoal, which connects together Fox, Egg, and Vin islands, by the ship channel over Horseshoe bar, which is only 400 yards wide, with a depth of 18 feet at low water.

Lightvessel.—A red schooner-rigged lightvessel on Horseshoe bar exhibits, at 43 feet above the sea, two fixed red lights, which should be seen in clear weather a distance of 8 miles. This vessel is often out of position after heavy weather.

Fog signal.—During thick or foggy weather a hand fog horn answers signals from vessels.

Bar buoy.—A can buoy (No. 1), painted black and white in vertical stripes, is moored in 22 feet water at the southern extreme of the outer bar, with the southeastern end of Huckleberry island bearing 199° , distant 1.3 miles. Close southward of this buoy there is a depth of 32 feet, the western part of a deep channel from seaward.

Lump buoy.—A black can buoy is moored in 16 feet water on Lump shoal between the southeastern extreme of the bar and Fox island and 314° , 1,800 yards from Bar buoy. A black spar buoy lies a short distance northward of Lump buoy.

Swashway buoy.—A red can buoy (No. 2) is moored in 23 feet water at the southwestern angle of the bar northward of the Swashway and 326° , nearly 1.2 miles from Bar buoy. The water shoals rapidly to 11 feet northward of this buoy.

Spit buoy.—A black can buoy is moored in 18 feet water at the eastern extreme of Spit shoal, extending 1 mile from the northern end of Fox island, and with the northwestern end of Fox island bearing 237° , distant a little more than 1 mile.

Portage Island channel buoys.—A black spar buoy is moored in 17 feet water at the eastern entrance to the channel for small vessels between the bars, with Portage Island lighthouse bearing about 265° , distant 2.4 miles. A red spar buoy is moored in 19 feet in the same channel at the western side of the outer part of the bar, with Portage Island lighthouse bearing about 276° , distant 1.8 miles. These buoys are nearly on the line of the southwestern and north-eastern light beacons, near the northern end of Fox island.

Horseshoe Bar buoys.—A cylindrical red buoy (No. 4), showing an intermittent white light, is moored in 18 feet water at the eastern edge of the inner bar 61° , distant 1,200 yards from Horseshoe Bar lightvessel; a similar buoy (No. 8) is moored in $3\frac{1}{2}$ fathoms of water 57° , 400 yards from Horseshoe Bar lightvessel. Between these two light-buoys is moored a conical red buoy (No. 6), the three buoys marking the best channel across Horseshoe bar.

Horseshoe Shoal buoy.—A red can buoy (No. 10) is moored in 23 feet water at the southwestern end of Horseshoe shoal.

Miramichi Inner bay is about 13 miles long from its entrance at Fox island to Sheldrake island, where Miramichi river may be said to commence, and about 8 miles wide. The depth of water across

the bay is sufficient for the largest vessels that can cross Horseshoe bar.

Oak point is situated on the northern side of the approach to the river entrance, 2 miles northward of Cheval point. The eastern part of Oak point has dark-colored sandstone cliffs about 12 feet high.

Lights—Oak Point range.—A square white lighthouse, 33 feet high, on the end of a point situated $\frac{1}{4}$ mile northeastward of Oak point, exhibits, at 45 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 12 miles.

A similar lighthouse, 53 feet high, at 32° , 600 yards from the preceding lighthouse, exhibits, at 60 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 12 miles. Both lights are visible from all points of approach in the river and bay.

These lighthouses, which show conspicuously against the dark background of the woods, or their lights, in line astern lead up Oak channel from the intersection of their alignment with that of Shelldrake Island light masts to Narrows buoy, near which Grand Beach lighthouses come in line.

Grandoon island, low and marshy, and difficult to distinguish from the mainland till very near, lies 53° , distant $2\frac{1}{2}$ miles from Oak point.

Grandoon buoy.—A red can buoy is moored in 25 feet water 400 yards southeastward of a shoal extending from the shore eastward of Oak point, with Oak Point northeast light beacon bearing 292° , distant $1\frac{1}{4}$ miles.

Anchorage.—There is a good and safe anchorage, in summer, in 4 to 5 fathoms, between Horseshoe shoal and the southern end of Portage island.

Vessels bound to sea usually anchor within the buoy on the southwestern end of Horseshoe shoal to wait for wind or high tide to cross Horseshoe bar.

Tides and tidal streams.—It is high water, full and change, at Portage Island lighthouse at 4h. 45m.; springs rise 5 feet, neaps $1\frac{3}{4}$ feet; neaps range 9 inches. Easterly winds raise the level of the water and northwesterly winds lower it.

It is high water, full and change, at Miramichi bar at 5h. 30m.; springs rise 5 feet, neaps 3 feet.

The flood stream runs strongly through the ship channel toward Portage island; it then divides, a strong stream that runs southward along the western coast of that island meeting the flood stream at its southern end, whence the stream decreases in strength, and distributes itself generally over Miramichi bay, the greatest rate being in the channel over Horseshoe bar and between Horseshoe shoal and Portage island.

The ebb stream runs in the direction of the channel over Horseshoe bar straight to seaward, its rate gradually diminishing as the bay is reached. It is joined by a stream running down the western coast of Portage island, which deflects it slightly to the southward. The stream down the ship channel is not very strong, and runs in the line of that channel. There is scarcely any ebb stream eastward of Bar buoy.

The greatest rate of the tidal stream near Miramichi bay is about $2\frac{1}{2}$ knots an hour.

At the anchorage southward of Portage island the ebb stream makes about an hour after high water, and runs 7 hours; the flood stream begins about $1\frac{1}{4}$ hours after low water, and runs $5\frac{1}{2}$ hours, with slack water for about $\frac{1}{2}$ hour between each stream.

Ice.—Navigation opens at Portage island about April 13 and closes about December 12.

Caution is necessary with regard to the buoyage, as it is subject to alteration.

Pilotage is compulsory in Miramichi bay and river. Pilots are generally to be found in the entrance of the bay, although their district extends eastward to Magdalen islands, southward to Kouchibouguac river, and northeastward to Miscou point.

Directions for Miramichi bay.—Miramichi bar should not be attempted, except in a small craft, without a pilot or by one possessing local knowledge; but in case of emergency proceed as follows, observing that great caution is necessary unless able to reach the anchorage before dark, and that it may be advisable to stand off and on till daylight, not coming into less than 12 fathoms water, especially with an easterly wind.

During heavy easterly gales in the fall of the year, especially while the ebb stream makes, there is a dangerous and heavy breaking sea on the banks extending from Fox and Huckleberry islands, which has in several instances rendered vessels so unmanageable that they have gone ashore on the islands. To avoid this difficult part the Swashway is used by the pilots, as being more direct, with vessels of suitable draft.

Round Escuminac point in 5 fathoms by day, and 10 fathoms by night, or at distances of $2\frac{1}{2}$ and 4 miles, respectively, and steer for Bar buoy, which pass close to on its southern side.

Then keep Preston Beach lighthouses in line astern, 139° , until the Swashway lighthouses are also in line, bearing 260° , when steer 306° to Spit buoy, a distance of nearly 3 miles; leaving the buoy on the port hand, continue the same course until Miramichi Bay light-vessel at Horseshoe bar bears 252° , when steer about 256° for the red gas-buoy at the eastern edge of Horseshoe bar. In a long vessel bring this buoy and the one next above it in line, and then to obtain

the deepest water in the channel, 18 feet, pass very close to and southward of the buoys, making direct courses from each one to the next. In steering for the buoy on the southwestern end of Horseshoe shoal keep it a little on the starboard bow and leave it well on the starboard hand. From the buoy at the southwestern end of Horseshoe shoal steer 275° for $4\frac{1}{2}$ miles to the eastern part of Oak channel, or until Grandoon buoy bears 227° . There is a depth of 16 feet at low water over the flats southeastward of Oak channel, but the mud is so soft that with a strong fair wind vessels can force their way when drawing 2 feet more than the depth of water.

When Grandoon buoy bears 227° steer for it. Pass close southward of Grandoon buoy, and then steer with Sheldrake Island light masts in line, 247° , until Oak Point lighthouses are in line, bearing 32° ; keep these lighthouses in line astern, past Mussel Bed buoy, and up to Narrows buoy. The directions lead up in a depth of 15 feet at low water. Directions for the river above Narrows buoy, page 255.

Southern shore of the bay.—**French river** is small and shallow: there is a village of Acadians on the southern side of its entrance, bearing 245° from Fox gully, from which it is distant $1\frac{1}{4}$ miles. There is a conspicuous clump of pine trees on French River point, the northern entrance point of the river. The space eastward of the line joining Egg island and French river, and in the bay southward of the latter, is occupied by flats of sand, mud, and eel grass—the habitat of oysters, lobsters, and other shellfish. Shallow and intricate boat channels lead through these flats to Fox and Huckleberry gullies.

Egg and Vin islands are westward of Fox island; Egg island is small, low, and swampy; Vin island is $2\frac{1}{4}$ miles long, and for the most part thickly wooded.

Vin harbor, which is southward of Vin island and is a bay of that island, $\frac{3}{4}$ mile long and only 600 yards wide, is approached round the western end of the island, which is distant nearly $4\frac{1}{2}$ miles from the northern point of Fox island. The harbor is sheltered from all winds, and has plenty of water for the largest vessels that can enter the inner bay.

Vin spit and shoal of the mainland are long and sandy, running out northward nearly to the line joining the sandy points of the harbor, but leaving a narrow channel to the eastward, which continues for about 2 miles, and is a prolongation of the harbor in that direction, or toward French River point.

Range lights.—On the western end of Vin island are two fixed white range lights. The front light is 30 feet above high water. The back light 33° , distant 407 yards from the front light, is 42 feet above high water. Each light is hoisted on a mast, with a red shed at its base, the front mast being 25 feet and the back one 30 feet high,

and the lights are of sufficient power to be seen, in clear weather and when they are in line, a distance of 10 miles.

Buoys.—A black spar buoy is moored in 12 feet water 275° , 1,000 yards from the front range light mast on Vin island.

A red spar buoy is moored in $1\frac{3}{4}$ fathoms at the northern end of Vin spit, on the southern side of the harbor.

A red spar buoy is moored in $1\frac{3}{4}$ fathoms at about 307° , 1 mile from French River point.

Anchorage.—Near the middle of the harbor, in 10 fathoms, mud bottom.

Tides.—It is high water, full and change, in Vin harbor at 5h. 45m.; springs rise 5 feet, neaps 3 feet, but the rise is uncertain. neap tides sometimes not ranging above 1 foot, and spring tides not above 2 feet. The a. m. tides in August are higher in general by 2 feet than the p. m. tides.

Directions.—A pilot may generally be procured to take a vessel into Vin harbor; if unable to get one: From the buoy at the southwestern end of Horseshoe shoal steer 228° for about 3 miles, keeping the lead going, and then round the western end of Vin island at a distance of not less than $\frac{3}{4}$ mile, leaving the black buoy on the port hand, until the range light masts on that end of the island are in line bearing 33° . The vessel will then be southward of the shoal extending from the western end of the island. Approach the harbor steering toward the light masts with the high light mast open to the right of the low one, and on shoaling the water when closing the sandy southwestern point of the island, sheer to the southward sufficiently to round it at a distance of 150 yards. When past the point, in order to clear Vin shoal, which extends off the mainland opposite, do not go southward of the line joining the sandy points of the harbor.

Vin bay is about 3 miles wide and nearly as deep. Quart point, its western point, bearing about 270° , 3.3 miles from the western end of Vin island, is a low cliff of sandstone with high trees on it. There is a good anchorage in the eastern part of this bay, in 3 fathoms, mud bottom, and about $\frac{3}{4}$ mile westward of the island. The western side of the bay is shallow. A pier, 760 feet long, runs out into a depth of 8 feet at low water in Vin bay.

Vin river, which has a depth of 6 feet at low water in its entrance, flows into the southern part of Vin bay 208° , $2\frac{1}{2}$ miles from the southwestern point of the island. There is a small but neat church on its eastern shore, a short distance within its entrance, and flourishing farms on either side, where supplies may, perhaps, be obtained. The best watering place of the vicinity is also at this river; but it is diffi-

cult to obtain large supplies of good water in so flat a country near the sea.

There is a tolerable road from Vin river to Chatham, the principal town on Miramichi river.

Black river, into which 9 feet can be carried at low water through a narrow and difficult channel, flows into the southwestern corner of Vin bay, and the river has 3 fathoms in it for some distance within the entrance.

Cheval point, bearing 267° nearly 3 miles from Quart point, is sandy, with a remarkable clump of high trees upon it.

Immediately westward of Cheval point is the shallow Napan bay and river which boats can ascend for several miles, or as far as the tide reaches. Above that point the Miramichi river, which is small, runs through a fertile and well cultivated valley extending westward in rear of the town of Chatham.

Middle ground is a long sandy bank, with less than 2 fathoms water over it, which stretches down the middle of the Miramichi estuary for $2\frac{3}{4}$ miles east-northeastward from Cheval point.

Sheldrake island lies rather more than $\frac{3}{4}$ mile off Napan point, and bears from Cheval point 281° , $1\frac{3}{4}$ miles. It is low, swampy, partly wooded, and on its eastern side has two buildings which were formerly used as a cholera hospital—a strange situation, considering that the place in a swamp and the mosquitoes innumerable. The island, which is 600 yards long and 500 yards wide, is separated from the northern shore by a channel $\frac{1}{2}$ mile wide, but with only 1 or 2 feet in it at low water. Shallow water extends far off this island in every direction—westward to Bartibog island and eastward to Oak point; it also sweeps round to the southward and southeastward, so as to leave only a narrow channel between it and the shoal which fills Napan bay and, trending eastward past Cheval point, forms Middle ground.

Lights—Sheldrake Island range.—Two lanterns, hoisted on masts 46 and 39 feet high, with sheds at their bases and 388 yards apart 247° on the northern side of Sheldrake island, exhibit, at 45 and 35 feet above high water, fixed white lights. The high light should be seen in clear weather a distance of 12 miles and the low one 10 miles.

The lights in line 247° lead up Oak channel from Grandoon buoy to the intersection of their range line with that of Oak Point range lights.

Tides.—It is high water, full and change, at Sheldrake island at 6h. 0m.: springs rise 5 feet, neaps 3 feet.

Spit point and Murdoch point are two sandy points on the southern shore of the river, 800 yards apart, with a cove between them, and about 1 mile southwestward of Sheldrake island.

The entrance of Miramichi river is $\frac{3}{4}$ mile wide between the points mentioned in the preceding paragraph and Moody point, the east point of Bartibog river entrance, which is a mile, 276° , from Sheldrake island, and has a small Indian church on it.

Loggieville, formerly Black brook, nearly a mile above Murdoch point, is the terminus of the Canada Eastern railway, and a port of call for the steamers of the Miramichi Steam Navigation Company, which ply between Escuminac, Neguac, Chatham, and Newcastle. It has a telegraph office. It also has a wharf 212 feet long, with a depth of 10 feet at its outer end at low water.

St. Andrew point, $1\frac{1}{2}$ miles above Murdoch point and on the same side of the river, shows as the extreme of the land from Sheldrake island. Black Brook mill, which has a large chimney, visible from Grandoon buoy, is situated on St. Andrew point.

Bartibog river is $\frac{3}{4}$ mile wide at its entrance between Malcolm and Moody points, but contracts to 300 yards a short distance within, where it is crossed by a wooden bridge. Bartibog island lies in the entrance of the river, has steep banks or clay cliffs on every side, and is nearly joined to the shore to the northward by a sandy spit. The narrow channel into the river passes close to the eastern end of the island, and has 4 feet in it at low water.

Grant Beach range lights.—Two square white lighthouses, each 37 feet high, at Grant beach, Bartibog, exhibit at 107 and 69 feet above high water fixed white range lights, which should be seen, in clear weather, a distance of 4 miles.

The front light is visible from all points of approach by water. The rear light is visible on the range line and also up the river. The lights, which are 433 yards apart, in line 271° , mark the channel from the conical buoy at the narrows of Sheldrake channel up to abreast Malcolm point.

Directions.—Pilotage is compulsory in Miramichi river, and there are numerous pilots. The following directions may assist vessels proceeding up the river to the first anchorage. Narrows buoy is moored in 3 fathoms on the northern side of Sheldrake channel, where the channel is 300 yards wide with a depth of 8 fathoms. Pass close southward of this buoy and steer about 236° until Grant Beach lighthouses are in line 271° ; then keep these lighthouses in line and pass close southward of Sheldrake buoy. This buoy is situated on the southwestern side of Sheldrake shoals, and bears 247° , 1,400 yards, from the southwestern point of Sheldrake island. Continue with the lighthouses in line and anchor nearly midway between Murdoch point and the eastern end of Bartibog island, in 4 fathoms at low water, mud bottom. This position is well sheltered from easterly winds by Sheldrake island and its shoals.

At this anchorage the rate of the tidal streams seldom exceeds 2 knots, but in the narrows of Sheldrake channel the rate of the ebb is 3 knots and perhaps stronger when the water is high, as it often is in the spring of the year.

Water can be obtained at Moody point, or at any of the brooks which descend the steep banks westward of Bartibog river.

Miramichi river commences at Sheldrake island: below that island the inner bay, with its low and widely receding shores, bears no resemblance to a river. The river is $\frac{3}{4}$ mile wide at Murdoch point, and $\frac{1}{2}$ mile at St. Andrew point, a breadth which it retains nearly up to Chatham. At its entrance the country rises into gentle undulations, terminating in steep banks and cliffs of sandstone, which in some places attain a height of 50 feet. Within the entrance the settlements increase in number and extent, and soon become continuous on either side, with steam sawmills here and there. In the vicinity of the towns of Chatham and Newcastle and the village of Douglastown there are many pretty buildings, and the country is by no means devoid of beauty.

The rocks which appear on the banks of the river are sandstones belonging to the coal formation, the vegetable organic remains of which are frequently met with in veins containing bituminous coal. Thin seams or veins of coal of good quality have been met with, but not as yet in such quantities as to be worth the working. The country bordering on the river is well cultivated, the soil being deep, light, and friable yet seeming sufficiently fertile for almost every agricultural purpose. The majority of the inhabitants are engaged in occupations connected with the timber trade, although some are occupied successfully and to an increasing extent with farming. The salmon and alewives fisheries are also extensively prosecuted in their seasons, and cod fishing on the banks in the gulf.

Miramichi river is navigable up to Beaubère island by any vessel that can cross the inner bar.

Written directions for the Miramichi above the anchorage between Murdoch point and Bartibog would be useless, because pilotage is compulsory and pilots plentiful; besides, there are very few landmarks that could be easily recognized by a stranger.

Ice.—The average date of the closing of navigation at Chatham is December 5 and of the opening April 20, the river being completely closed between those dates.

The first vessel arrives about May 12 and the last leaves about November 26.

St. Andrew banks lie in the middle of the river southward of Grant beach. The western bank is marked by a black buoy on its northern side and a red buoy on its southwestern side.

Legget shoal, $\frac{1}{2}$ mile above St. Andrew banks, lies nearer the northern than the southern side of the river, and had 12 feet upon it at low water; but this depth, and also that upon the banks of St. Andrew, is said to vary, in consequence of old trees, logs, and other lumber lodging upon them. The same cause is said to render the depth uncertain to the southward of this shoal, where there is a wider channel. The channel at the black stake on the northwestern side of Legget shoal has $2\frac{1}{2}$ to 5 fathoms water in it, and is nearly 200 yards wide between the shoal and a shoal bank which extends off the northern shore. On the point of this shoal bank and about $\frac{1}{4}$ mile above Legget shoal there is a red stake. Vessels must pass close northward of the black stake, and close southward of the red stake, which is 2 miles above Bartibog river.

The river is clear of detached shoals from Legget shoal to Middle island, abreast which on the northern side of the river there are 4 to 7 fathoms close to the sandstone cliffs until off Gilmour mill and cove, nearly opposite the western end of Middle island.

Middle island is rather smaller than Sheldrake island, from which it is distant $5\frac{1}{2}$ miles, and together with its shoal it confines the ship channel to the northern side of the river there being no channel to the southward of it at low water.

The fairway of the river is clear from Gilmour mill to the wharf at Chatham.

Light.—A mast, 45 feet high, with a shed at its base on the northern side of Middle island, exhibits, at 44 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 11 miles.

Chatham, the principal town on the Miramichi, and containing in 1901 4,868 inhabitants, commences $\frac{1}{2}$ mile above Middle island, and extends along the right bank of the river for $1\frac{1}{4}$ miles. The town is straggling, but it contains some handsome buildings, among which are a college and a hospital. It is one of the principal lumber ports of New Brunswick, being conveniently situated for shipping, and having a depth of 6 to 8 fathoms water close to its wharves.

Storm signals are exhibited at Chatham.

Quarantine.—Chatham is a minor quarantine station and maintains a seaman's hospital.

Tugs may be obtained from Chatham by signal to Escuminac lighthouse signal station, but there is no regular charge.

Communication.—Chatham is connected by the Canada Eastern Railway with Fredericton. This railway has junctions with the Intercolonial railway at about 6 miles above Chatham and with the

Canadian Pacific railway at Fredericton. Steamers of the Miramichi Steam Navigation Company call here.

Telegraph.—Chatham is in telegraphic communication with all the towns of the Dominion of Canada and the United States.

Douglastown, on the left bank, about $1\frac{1}{2}$ miles above Chatham, is a much smaller place, containing some 400 inhabitants. It is prettily situated on a rising ground, and has sufficient water at its wharves for vessels of moderate size. The most noticeable building is the Marine hospital, built of stone.

Abram's shipbuilding establishment is $1\frac{1}{4}$ miles above Douglastown, on the same side of the river. Opposite to it, on the right bank, is the English church of St. Paul.

Light.—A square white lighthouse, 23 feet high, with a red roof, on Limekiln bank, on the northern bank of the river just below Newcastle and $2\frac{1}{2}$ miles above Douglastown, exhibits, at 87 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 9 miles.

Newcastle, $2\frac{1}{2}$ miles farther up the river, and on the left or northern bank, is the county town, containing the court-house and the jail. It had a population of 2,507 inhabitants in 1901. Standing on an acclivity which rises to the height of 100 feet at $\frac{1}{4}$ mile from the river, and commanding a view over the lower ground westward and southward to Beaubère island and Nelson town, and down the river to Chatham, a distance of nearly 5 miles, its situation is beautiful, while at the same time it is favorable for mercantile purposes, the river opposite it being 600 yards wide, clear of shoals, with 4 to 6 fathoms water close to the wharves.

The Intercolonial railway from Bathurst to Moncton passes through Newcastle.

The United States is represented at Newcastle by a consular agent.

Nelson town, on the right or southern bank, opposite the eastern end of Beaubère island about $1\frac{1}{4}$ miles above Newcastle, and the last village within the navigable waters of the Miramichi, is a straggling place with about 200 inhabitants, principally of Irish origin. The village possesses a large wooden Roman Catholic chapel.

Supplies.—At Chatham, meat, bread, and vegetables are obtainable; but of the last potatoes only are plentiful. The best water is taken from springs, although the surface water of the river is quite fresh on the ebb tide. Supplies of any kind can be procured at Chatham or Newcastle.

Coal.—About 1,000 tons of coal are usually in store at Chatham, and about 200 tons at Newcastle, but any quantity can be obtained at short notice by Intercolonial railway from Pictou.

Trade.—The chief exports from Chatham, Douglastown, and Newcastle are timber, dressed lumber, paling, salmon, lobster, and extract of hemlock bark for tanning.

Repairs.—There is neither dock nor slip in Miramichi river, but at Chatham there is a wharf for heaving down vessels for repairs, and there are also shipyards and foundries.

Beaubère island, $1\frac{1}{4}$ miles long and $\frac{1}{4}$ mile wide, is a pretty island, having steep clay banks, based on sandstone, and rising about 20 feet above the river. It is situated nearly $1\frac{1}{2}$ miles above and south of Newcastle.

Miramichi river is navigable to this point by any vessels that can cross Horseshoe bar. In some parts of the channel above Chatham there are only $2\frac{1}{4}$ fathoms, which would have to be avoided by a large vessel at low water; Wright bank, with 8 feet water over it, is the only detached shoal, and it lies less than halfway across from the right bank about $\frac{1}{4}$ mile above Douglastown.

Tides and tidal streams.—It is high water, full and change, at Beaubère island at 6h. 30m.; springs rise 6 feet, neaps 4 feet.

In July and August, when the observations were made, excepting for 2 or 3 days at neaps, the a. m. tides rose 2 or 3 feet higher than the p. m. tides, and were of longer duration by 1 or even 2 hours at a time. But this is much influenced by winds, and consequently by no means regular. The mean length of the flood tide is 6 hours, and of the ebb $6\frac{1}{2}$ hours. The usual average rate of the ebb stream is 2 knots, and of the flood 1 knot, in this part of the river. The ebb in some places runs $2\frac{1}{2}$ knots, and in the spring of the year is said to be still stronger. The duration and length of the tidal streams are also influenced by the winds, but in general they continue in the channel about $\frac{1}{2}$ hour after high and low water on the shore.

Northwest and Southwest arms.—At Beaubère island the two great arms of the Miramichi meet. Northwest arm is much the larger, as respects the tidal water, although Southwest arm is considered the main branch, being of greater length, and discharging more water. Northwest arm would be navigable for large vessels to Shilelah cove, 7 miles above Beaubère island, as there is sufficient depth of water, if the channel were buoyed or staked in the narrow parts, which are not more than 100 yards wide. Above Shilelah cove there are 1 to $1\frac{1}{2}$ fathoms water, in intricate and narrow channels between shoals of mud and low marshy islands, all the way to the rapids, which flow in narrow channels between meadow islands. There the tide ends, and the water is quite fresh 13 miles above Beaubère island, and 39 miles from the entrance of the inner bay at Fox island. On the right bank there is an Indian village just below the rapids. The banks of clay and sandstone are almost everywhere

bold and dry, with improving farms on either side, and the scenery in this fine arm possesses considerable beauty.

Southwest arm is not navigable for large vessels, as only 6 feet at low water springs can be carried through between Beaubère island and the mainland, and above that shallow part, although there are 2 fathoms water in places, yet the channel is too narrow and intricate for any but very small vessels. The arm is about $\frac{1}{4}$ mile wide for the first 5 miles, or up to Barnaby island, after which it varies from 200 to 400 yards up to the rapids, 12 miles from Beaubère island. On the left bank at the rapids, where the river is 100 yards wide, is Indian town, an Indian village. Both shores of this arm are settled, and many of the farms appear to be in a flourishing condition.

The Intercolonial railway runs along the left bank of Southwest arm to Indian town and thence the Canada Eastern railway runs to Blackville about 6 miles farther up; the Canada Eastern railway also runs along the right bank from Loggieville to Blackville, whence it continues to Fredericton.

Light.—A fixed red light is shown from the drawbridge over the Northwest arm about $2\frac{1}{2}$ miles above Newcastle. The lantern is hoisted on a mast situated on the western side of the abutment of the southern end of the draw span, and 122 feet from the northern side of the channel and opening of draw.

Tides.—The tide, which ends at the rapids, was observed to rise 2 feet there, and it was high water on the day of the full moon at about 8h. 0m.; as it was also at the foot of the rapids in Northwest arm.

Northern shore of the bay from Oak point trends northwestward for 14 miles, thence 2 miles eastward to Blackland point, the northern entrance point on the mainland of Miramichi bay. The first 8 miles of this shore to Burnt church practically unbroken.

Burnt church is a fishing and farming settlement much frequented as a summer resort, situated about 48° , $5\frac{1}{2}$ miles from Grandoon island, and on the northern shore of Miramichi bay. The village, which has a population of about 200 inhabitants, contains two white buildings that are noticeable from eastward, and a church that has a spire. A wharf extends 260 feet off the shore and has a depth of 9 feet at its outer end at low water. There is an Indian settlement just southwestward of the village.

Burnt river flows into the bay, passing northeastward of the village.

A steamer of the Miramichi Steam Navigation Company calls twice daily during the season.

Channel.—A clear channel, with $3\frac{1}{2}$ to $2\frac{1}{4}$ fathoms water in it, runs northward of the Horseshoe and the shoals of Portage island, and

northeastward to $\frac{3}{4}$ mile from Hay island, whence a narrow channel, suitable only for boats and small craft, leads out to sea through Neguac gully.

Hay island.—The southwestern end of Hay island, which is nearly connected with the main by shoal water, lies northeastward $1\frac{1}{4}$ miles from Burnt church, and the island extends east-northeastward 1.4 miles.

Lights—Hay Island range.—A white square wooden tower, 19 feet high, with a red roof, situated near the eastern end of Hay island, exhibits, at 23 feet above high water, a fixed white light, which should be seen, in clear weather, on the line of range, a distance of 10 miles.

A square white lighthouse, 21 feet high, with a red roof, situated 255° , 75 yards from the preceding lighthouse, exhibits, at 30 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 11 miles. This light is visible from the southward as well as on the range line.

These lights in line enable vessels seeking shelter to clear the point of the shoal off the eastern end of Hay island.

Upper Neguac village, having a population of about 150 inhabitants, containing a church with a spire, and a post-office, lies on the shore of the bay about $1\frac{1}{2}$ miles north-northeastward of the southwestern end of Hay island.

Neguac sand bar commences at about a mile northeastward from the northern end of Portage island, and, together with several smaller sand bars lying off Blackland point, forms the coast to Tabusintac gully, a distance of 4 miles northeastward.

Neguac gully, between Neguac sand bar and a small sand bar to the southwestward, is nearly 400 yards wide and carries 2 fathoms water, but a shifting sand bar, with 10 feet over it at low water, lies off the gully. Within the gully is a narrow channel (see above). Shoal water extends $1\frac{1}{4}$ miles off this gully, but there is excellent warning by the lead. Shoals nearly dry at low water extend from Neguac gully to Portage island, a distance of $\frac{3}{4}$ mile.

Range lights.—A lantern on a mast, 25 feet high, with a white shed at its base, on the northeastern side of Neguac gully, exhibits, at 26 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 7 miles.

A square white tower, 30 feet high, with a red roof, at 348° , 300 yards from the preceding light mast, exhibits, at 32 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 11 miles.

The alignment of these lights leads to the buoy marking the crossing of the outer bar of Neguac gully.

Buoys.—A red can buoy is moored in 4 fathoms at the entrance to Neguac gully. A similar buoy is moored northwestward of the outer buoy, and shows the direction of the channel.

Lower Neguac village is on the shore of the bay about $1\frac{1}{2}$ miles northeastward of Upper Neguac. Both of these are Acadian villages inhabited by fishermen and farmers. There are excellent oysters in their locality. The wharf at Lower Neguac is a cribwork block, with $5\frac{1}{2}$ feet water at its outer end, which is connected with the shore by a roadway running northward 1,180 feet to high water mark, where it ends near a fish house and a store.

Range lights.—A mast, 25 feet high, with a white shed at its base, on Lower Neguac wharf, 20 yards from its outer end, exhibits, at 28 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 8 miles.

A square white lighthouse, 33 feet high, with a red lantern, situated on the beach 312° , 360 yards from the preceding mast, exhibits, at 32 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 10 miles.

These lights in line lead over the bars inside Neguac gully. The outer light leads to the wharf.

Blackland point, the northern point of Miramichi bay, lying about $3\frac{1}{4}$ miles east-northeastward of Lower Neguac, is low and swampy, with steep and black peaty banks. There is a communication round it for boats within the sand bars, from Miramichi inner bay into Tabusintac lagoon.

Tabusintac gully, $1\frac{3}{4}$ miles northeastward of Blackland point, is about 300 yards wide at high water, and has a shifting bar of sand, over which, when it was surveyed, 6 to 7 feet could be carried at low water, and 11 or 12 feet at high water in spring tides.

Tabusintac river.—The entrance of Tabusintac river from the lagoon inland is 3 miles to the northward of the gully, and can be seen over the sand bars. When over the bar there is a depth of 2 to 3 fathoms in the channel through the lagoon, and as much as 4 to 5 fathoms in some parts of the river, but the channel is narrow and intricate, and suitable only for boats or very small craft. The tide flows 10 miles up the river, through an undulating country, and occasionally between steep banks of sandstone, which rise about 100 feet above the sea. There are settlements, consisting principally of Scotch families, on either shore, and there is a church on the right bank $1\frac{1}{2}$ miles up from the lagoon.

Salmon are taken in considerable numbers in the Tabusintac, and lobsters, oysters, and other shellfish in the lagoon; codfish, which come in upon the coast early in the season, are caught upon a small scale.

Raft gully is an entrance into Tabusintac lagoon about $6\frac{1}{4}$ miles north-northeastward of Tabusintac gully, but it is nearly blocked up with sand.

Tracadie lagoon is one of the several large lagoons situated on the eastern coast of New Brunswick, separated from the sea by long, sandy beaches, and entered only by narrow channels termed gullies. Of these there are three leading to Tracadie lagoon, known as South, Old, and North gullies.

The lagoon is some 6 miles long, with a width of $\frac{1}{4}$ to 1 mile or more, but, except in South and North Tracadie river channels, and in the channels entering from the gullies, it is very shoal and almost dry at low water; it affords well sheltered boat or canoe navigation.

South or Little Tracadie gully, which is situated 7 miles northward from Raft gully, had $4\frac{1}{2}$ feet over its bar in the summer of 1839. South Tracadie river, which discharges its waters, after traversing a lagoon, by this gully into the sea, is separated from North Tracadie lagoon by a point of the mainland which approaches near the sand bars, but still leaves a communication within them from the one lagoon to the other.

There are huts and fish stores at the entrance of the gully, and Acadian settlements at the entrance of the river.

Light.—A square red lighthouse, 26 feet high, on the northern side of South gully, exhibits, at 26 feet above high water, a fixed red light, which should be seen in clear weather a distance of 8 miles.

Old gully, 1 mile northward of South gully, is now nearly blocked up with sand, but it was formerly the principal entrance to Tracadie lagoon.

North gully of Tracadie is northward 2 miles from Old gully, and is at present the principal entrance to the very extensive lagoon, through which North Tracadie river flows in a narrow channel between flats of sand, mud, and weeds, the habitation of innumerable shellfish. There are several huts and stores at the entrance of this gully, which is 300 yards wide at high water, but, like all the rest on this coast, has a shifting bar of sand off it, causing the depth, breadth, and direction of the channel to vary frequently in heavy gales. In 1839 there were 6 to 7 feet over the bar at low water, and 11 or 12 feet at high water, springs, yet it was said that there was often not more than 8 feet in the highest tides. In the entrance of the gully, and sheltered by the bar outside, small vessels moor in $1\frac{1}{2}$ to 3 fathoms water. In the channel of the river opposite the village there are 2 to 3 fathoms, but that can only be reached by passing through the lagoon, where the channel in one part is so shallow that boats can pass only when the tide is in.

Range lights.—A square white lighthouse, 34 feet high, with a red lantern, on the sand flat on the northern side of North gully, exhibits, at 37 feet above high water, a fixed white light, which should be seen in clear weather a distance of 11 miles. This is both a coast and a range light.

A red mast, on the sands at 108° , 54 yards from the preceding lighthouse, exhibits, at 20 feet above high water, a fixed white light, which should be seen in clear weather a distance of 4 miles. This light is exhibited only when it can be ranged with the channel.

Directions.—The lighthouse and mast in line, 288° , lead to a red can buoy moored in $4\frac{1}{2}$ fathoms water outside the bar, and to a second red can buoy at the mouth of the gully; thence the tortuous channel up to "the block" is marked by buoys and stakes.

Caution.—The channel into North gully changes so frequently and suddenly that it is impossible to keep mariners notified of the alterations. The range lighthouse and mast can be used only by mariners having local knowledge. No vessel larger than a fishing boat should attempt to enter the gully at night, and no vessel must attempt the entrance without a pilot.

Tracadie village, which has two churches, is situated on the southern side of North Tracadie river entrance. A wharf, 1,430 feet long, has been constructed in order to provide shipping facilities for the district, which is large and contains some 2,000 inhabitants, who are principally Acadians, living by fishing, limited agriculture, and lumbering. Both rivers supply a considerable quantity of pine timber. There is a lazaretto at Tracadie.

The Gulf Shore railway runs from Tracadie to Pokemouche, where it connects with the Caraquet railway.

Green point, 4 miles north-northeastward of Tracadie North gully, separates Tracadie and Pokemouche lagoons. A rocky shoal extends $\frac{3}{4}$ mile off the point to a depth of 3 fathoms and $1\frac{1}{4}$ miles to 5 fathoms at low water.

Pokemouche river, $2\frac{1}{2}$ miles north-northeastward of Green point, after traversing a shallow and extensive lagoon, enters the gulf by Pokemouche gully, which is about 200 yards wide through the sand bars. A shifting bar of sand outside generally leaves a narrow channel. 4 to 5 feet deep at low water, into the gully, which has a depth of 9 to 12 feet for some distance within.

Light.—A square, white lighthouse, 37 feet high, with a keeper's dwelling attached, on the beach at the northern side of Pokemouche gully, exhibits at 35 feet above high water a fixed green light, which should be seen in clear weather a distance of 8 miles.

Buoy.—A black can buoy is moored in 3 fathoms directly outside the entrance to Pokemouche gully.

Tides.—Spring tides at Pokemouche rise 5 feet.

Directions.—Fishing vessels entering the gully make the buoy outside the entrance, whence the channel through the gully is marked by spar buoys. Large schooners can be taken in by a native pilot in fine weather, but local knowledge is required to enter.

Pokemouche village, on the southern side of the river entrance into the lagoon and $1\frac{3}{4}$ miles westward from the gully, contains a church, post-office, and sawmill. The inhabitants, 300 to 400 in number, and principally of Acadian French and Irish origin, live by fishing, a very limited agriculture, and lumbering.

Shippigan gully, about $5\frac{1}{4}$ miles northeastward of Pokemouche gully, is the southern entrance to Shippigan harbor and sound. A bar of sand at the entrance of the gully dries in part at low water and shifts in heavy gales, but there is generally a channel with 4 to 5 feet in it at low water, and the tide rises 3 feet at neaps and 5 feet at springs. Breakwaters have been constructed at the seaward entrance of the gully to improve the channel. The 3-fathom edge of the shoal water outside the bar is $\frac{1}{2}$ mile offshore, after which the depth increases rapidly. The tidal stream is generally very rapid in the gully, and dangerously heavy surf is often occasioned on its bar in heavy easterly gales. The passage over the bar and into this gully is difficult and dangerous to strangers, but it is constantly used by the native fishermen with their small schooner-rigged shallops.

Light.—A wooden, octagonal, white lighthouse, with a circular red lantern 54 feet high, on the eastern side of the southern entrance of Shippigan gully, exhibits at 54 feet above high water a flashing white light, giving 1 flash every 5 seconds, which should be seen in clear weather a distance of 12 miles.

Fog signal.—A hand horn at the lighthouse answers vessels' signals.

Range lights.—A red mast 27 feet high, with a small red shed at its base, on a sand bank at the extreme of Indian point and about 1,600 yards within the gully entrance, exhibits at 28 feet above high water a fixed white light, which should be seen in clear weather a distance of 10 miles.

A white mast 46 feet high, with a small white shed at its base, situated 326° , 45 yards from the preceding light mast, exhibits at 46 feet above high water a fixed white light, which should be seen in clear weather a distance of 11 miles.

These lights are visible only on and over a small arc on each side of the range line; and in that line lead up to the red can buoy outside the bar.

Buoys.—The gully is buoyed with red and black buoys.

Directions.—Entering Shippigan gully from the southward the alignment of the range light masts leads to a red can buoy outside the bar, within which there are three more red can buoys; all these buoys are left close-to on the starboard hand. At the inner of these buoys the channel turns sharply toward the lighthouse on the eastern side of the gully entrance; thence to the Government wharf at Shippigan the channel is very narrow and winds its way through extensive mud flats covered with eelgrass; but it is well defined by stakes driven into the bank at its edge and by spar buoys. The starboard hand stakes and buoys are red and are surmounted by cones, the port hand marks are black and are plain.

The last mark near the wharf is a black dolphin surmounted by a barrel. Northward of the Government wharf the colors are reversed. Local knowledge is necessary to enter the gully, as the channel constantly shifts.

The coast of Shippigan island from Shippigan gully curves in about a northeasterly direction for $13\frac{1}{2}$ miles to Miscou gully, whence the coast of Miscou island continues approximately in the same direction for $2\frac{1}{2}$ miles to Wilson point, and thence a little westward of north for 4 miles to Birch point.

Shoal water.—There are rocky patches with little more than 2 fathoms water over them about 1 mile off the coast of Shippigan island, and 6 miles northeastward of Shippigan gully; and a similar patch about the same distance off the low, sandy cliffs of the island 10 miles northeastward of the gully. Shoal water extends about 1,400 yards off Miscou gully; and Wilson bank, a sandy shoal, extends about 1.4 miles off the east coast of Miscou island to the depth of 5 fathoms; but as a depth of $5\frac{1}{2}$ fathoms has been obtained 3 miles eastward of Birch point, this bank should be given a sufficient berth.

Miscou gully, between Shippigan and Miscou islands, leads into Miscou harbor, but it admits boats only at high water.

Light.—A mast, 34 feet high, with a white shed at its base, standing on a crib, and situated on the northern side of the eastern entrance to Miscou gully, exhibits, at 54 feet above high water, a fixed white light, which should be seen, in all directions of approach by water, in clear weather a distance of 11 miles.

Miscou island, which is 8 miles long, north-northeast and south-southwest, and 4 miles broad, has about 500 inhabitants, occupied chiefly in fishing; they own 75 fishing boats, and have established 11 lobster factories.

Birch point, the northeastern extreme of Miscou island, is a steep sandstone cliff about 10 feet high, and may be easily recognized by the white birch trees on the point, they being higher than any others

on the coast in this locality. A reef of stones and sand extends $\frac{1}{2}$ mile off the shore near the point.

Light.—An octagonal, white lighthouse, 74 feet high, on Birch point, exhibits, at 79 feet above high water, a group revolving white light, showing 4 flashes every 75 seconds, with intervals of 15 seconds between the points of greatest brilliancy, the final flash of the group being followed by an interval of 30 seconds, during the greater part of which the light is eclipsed. The light should be seen seaward, in clear weather, a distance of 14 miles, and from the westward is visible over the island.

Fog signal.—A steam fog whistle, situated 107 yards eastward of the lighthouse on Birch point, sounds blasts of 5 seconds duration every 30 seconds in foggy weather or snowstorms.

Signal station.—At Birch point there is a signal station which is connected by telephone with the telegraph system.

North point of Miscou island, about $1\frac{1}{2}$ miles west-northwestward of Birch point, is distinguished by a green mound, or grassy sand hill. The northern end of the island is surrounded with steep, sandy beaches, on which are several fishermen's huts and stores. The shallow water does not there extend more than 800 yards offshore, but immediately eastward of the point, and fronting the outlet of a small lagoon, a sandy shoal commences and stretches off north-northeastward. The soundings enable the mariner easily to avoid this shoal. At 1 mile from the shore there is a depth of 3 fathoms, but it is more than $2\frac{1}{2}$ miles out to the 5 fathoms edge of the shoal.

Anchorage.—There is good anchorage off the lighthouse on Birch point, in $3\frac{1}{2}$ to 6 fathoms, with westerly winds; and on either side of the reef under North point, in 5 to 10 fathoms, with southerly winds, the bottom being sand, which holds sufficiently well for offshore winds.

Miscou banks extend about 22 miles eastward of Miscou island, and the soundings upon them afford sufficient guidance for a vessel approaching this coast. The shoalest parts of the banks bear about 68° from Birch Point lighthouse, in which direction, for 6 miles offshore, there are only $5\frac{1}{2}$ to 8 fathoms over rocky bottom; then the water deepens rapidly, there being 12 to 20 fathoms, with red sand, rock, and shells, for the next 9 miles; at 7 miles farther, with depths of 20 to 30 fathoms, over red sand, gravel, shells, and broken coral, is the edge of the bank, where the depth increases rapidly to over 40 fathoms, and the bottom changes to mud.

The northern edge of the banks, in 30 fathoms, is 7 to 8 miles northward of the 68° line of bearing from Birch Point lighthouse, and it passes North point of Miscou, at the distance of 4 miles, into Chaleur

bay, thus affording an excellent guide. Banks continue to extend off the coast to the southward, but with more regular soundings and a greater general depth than are found on Miscou banks.

Chaleur bay (bay of Chaleurs) is the largest bay in the gulf, being 25 miles wide across its entrance, from Miscou island to cape Espoir; but the entrance is more generally considered to be between North point of Miscou island and Maquereau point, which bears 318° , and is distant $14\frac{1}{2}$ miles. The depth of the bay, from Miscou to the entrance of Restigouche river, is about 75 miles.

The southern shore of the bay, or the coast of New Brunswick, is generally low, but between Caraket and Bathurst cliffs of red sandstone rise to 200 feet above the sea. The northern shore of the bay, or the coast of Quebec, is of moderate height, but an irregular range of hills, of considerable elevation, runs along a few miles inland. The predominating features of both shores are red cliffs of sandstone and shale, with intervening shingle and sand beaches; trap rocks and limestone are occasionally also met with, but more sparingly. The sandstone either belongs to, or is very nearly connected with, the coal formation, fossil vegetable remains of which, as well as thin veins of bituminous coal, being not infrequent.

There are numerous settlements around the bay, and the several harbors, roadsteads, and rivers are frequented by vessels engaged in the lumber trade and the fisheries.

Weather.—The weather is warmer and generally much finer within this bay than it is outside in the adjacent parts of the gulf. The fogs, which are prevalent with southerly winds on Miscou banks, seldom enter the bay, although rain and mist accompany easterly gales here as elsewhere.

Navigation is by no means difficult, for although there are some shoals, yet there is everywhere good warning by the lead.

Tidal streams.—The tidal streams are regular within the bay, and their rate seldom amounts to 1 knot an hour; but outside, off its mouth, and especially on Miscou banks, the currents and tidal streams are irregular, both in rate and direction; and their effect must be guarded against by the constant use of the lead and attention to the soundings.

Communication.—The Caraket railway runs along the southern shore of the bay from Shippigan to Bathurst, and the Intercolonial railway from Bathurst to Dalhousie and Matapedia, while the Atlantic and Lake Superior railway runs along the northern shore from Matapedia to Paspebiac.

A steamer leaves Dalhousie every Wednesday and Saturday morning for Gaspé and intermediate ports in the bay, arriving at Gaspé the same evening; the steamer returning leaves Gaspé every Monday

and Thursday morning. Connections are made at Dalhousie with the trains.

Directions in fogs.—When bound for Chaleur bay and approaching its entrance in foggy weather, do not attempt to make Maquereau point, which is so bold that there is little or no warning by the lead; but strike soundings on Miscou banks, and keep a cautious lookout for the numerous fishing schooners which are generally riding there. The northern edge of the banks, followed in 30 fathoms of water, leads past North point of Miscou, at the distance of 4 miles, and forms a sure guide up the bay.

The bank of soundings off the northern shore of the bay is also sufficiently wide to be a guide when within Maquereau point; nevertheless, in bad weather, do not approach the shore nearer than the depth of 30 fathoms in any part of the bay eastward of Carlisle point. The bottom is generally sand and shells on the banks, while in the central part of the bay black and brown mud prevail, with depths between 30 and 48 fathoms. Within, or westward of Carlisle point, and the opposite bay of Nipisiguit, the depth decreases to less than 30 fathoms, but there is still sufficient warning everywhere by the lead quite up to the head of the bay.

The northern and western coast of Miscou island from North point trends westward about $\frac{3}{4}$ mile, when it turns southward for $2\frac{1}{2}$ miles, then southwestward for 4 miles to Goose Lake lighthouse, and thence continues about southward $1\frac{3}{4}$ miles to Herring point.

About $3\frac{1}{2}$ miles north-northeastward of Goose Lake lighthouse there is an opening in the trees which extends across the island, and this opening has been mistaken at night or in foggy weather either for the harbor or the gully, according as it was seen from westward or eastward of the island. During summer there is moderately good anchorage in 10 to 11 fathoms, with this opening bearing 128° .

Lights.—A square white lighthouse, 28 feet high, on the western coast of Miscou island at Goose lake, exhibits, at 40 feet above high water, a revolving white light, which attains its greatest brilliancy every minute, and should be seen, in clear weather, a distance of 10 miles.

A mast, 35 feet high, with a shed at its base standing on a low cribwork pier, all painted white, at Harper point, southeast of Herring point, at the western entrance to Miscou harbor, exhibits, at 48 feet above high water, a fixed white light, which should be seen, in all directions of approach by water, in clear weather, a distance of 12 miles.

Signal station.—At Goose Lake lighthouse there is a signal station, which is connected with Shippigan by telephone.

Miscou flat.—This flat, which is of sandstone, begins about 3 miles northward of Goose Lake lighthouse and continues southwestward to Miscou channel. The 5 fathoms edge of the flat is fully $4\frac{1}{4}$ miles northwestward of Goose Lake lighthouse, and there are not more than 3 fathoms at the distance of $2\frac{1}{4}$ miles from the same point.

Miscou harbor, frequently called Little Shippigan by the fishermen, lies between Miscou and Shippigan islands, and just within the sandy spit at the southwestern end of Miscou, where the space of water, 4 to 6 fathoms deep, forming the harbor for large vessels, is 400 yards wide and upward of 1 mile in length. The harbor for small craft is of considerably greater breadth, with 2 to $2\frac{1}{2}$ fathoms water, and also a narrow channel extending eastward through the flats of mud and weeds to within 1 mile of Miscou gully. The bottom within the harbor is soft mud; in Miscou channel, just outside the entrance, sand; and between the shoals, farther out, sandstone.

Miscou channel, leading to the harbor, between Miscou flat on the northeast and Shippigan flat and Shippigan shoals on the southwest, is in one part only 375 yards wide, between shoals so steep that there is not the slightest warning by the lead. The harbor is much frequented by American fishermen. A wharf is constructed on the shore of the harbor to afford landing facilities.

Directions.—No vessels, except small ones, should attempt Miscou harbor without a pilot or having first buoyed the channel. If drawing 12 feet or less the following directions may be used, but much caution is necessary: From the northeastward, cross Miscou flat to the southwestward, at 3 miles offshore and in not less than 4 fathoms water; from the westward follow the northern edge of the Shippigan flat, in 4 to 5 fathoms. Enter Miscou channel with the northeastern end of the trees on Shippigan island just open southwestward of the southwestern end of the trees on Miscou island, or keep the former in line with the extreme of the sandy spit at the southwestern end of Miscou island, bearing a little eastward of 111° , the latter being preferable if it can be made out. When the water shoals to less than 4 fathoms, which will be on a point of Miscou flat, sheer to the southwestward for about $\frac{1}{4}$ mile, or so as to deepen the water to 4 and 5 fathoms; then steer 117° , or for Pandora point, a wooded extreme of Shippigan, $\frac{1}{2}$ mile within Pecten point, which is the sandy southern entrance point of the harbor.

In running this course a bay in Miscou flat is crossed in 4 and 5 fathoms; if the soundings deepen to more than the latter depth at low water sheer to the eastward, in order to keep on the Miscou, or least dangerous side, of the channel, for which the lead is the guide, as there are 8 to 9 fathoms in the channel. When the points on the northern side of Shippigan come in line 229° , and a high sand hill, on the sand bars at the head of the harbor, is in line with the high-

water extreme of Miscou sandy spit 97° , the narrow part of the channel is reached. Thence follow the edge of Miscou flat in 4 to 6 fathoms, sheering to the eastward when the depth is over 6 fathoms, and to the southward when it is less than 4 fathoms, but keeping a general course toward Pandora point until the points on the southeastern coast of Miscou island, within the harbor, open, bearing 49° . There is then safe anchorage, although it is outside the harbor entrance. To proceed farther in, steer for the high sand hill on the sand bars, with the hill bearing about 83° , and when within the sandy point steer about 66° , or for the gully, for a short distance, and anchor.

Tides and tidal streams.—It is high water, full and change, in Miscou harbor at 2h. 30m.; springs rise 5 feet, neaps 3 feet. The streams appear to set fairly in and out of the harbor at a rate generally less than 1 knot.

Shippigan flat, which separates Miscou and Shippigan channels, is a sandstone shoal extending westward nearly 5 miles from Mya point, the northern end of Shippigan island; it is thinly and partly covered with sand and has in some places a depth of only 5 feet water. There is good warning by the lead along its northern side, which may be approached to from 6 to 3 fathoms, according to the vessel's draft.

Buoy.—A can buoy, painted red and black in horizontal bands, is moored on the middle of Ship flat, a shoal on Shippigan flat, which has 5 to 7 feet water on it, and is $\frac{1}{2}$ mile long, east and west, and 400 yards broad. From the buoy Goose Lake lighthouse bears 55° , distant about 3.8 miles.

Pokesuedie shoal, having only 6 to 9 feet water over its greater part, is a flat of sand extending northward and eastward 2 miles from Pokesuedie island, which lies about $1\frac{3}{4}$ miles westward of the southwestern part of Shippigan island.

Caraquet church steeple and the southeastern sandy point of Caraquet island in line, 243° , leads over its northern part in 2 fathoms, and the steeple half way between the extreme sandy point and the end of the trees on Caraquet island leads northward of the shoal in $4\frac{1}{2}$ fathoms, but as both the sandy point and the trees may change, these marks should not be used without examination.

Light.—A square white lighthouse, 34 feet high, on the northeastern point of Pokesuedie island, exhibits, at 41 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 11 miles.

Fog signal.—A hand horn at the lighthouse answers vessels' signals.

Shippigan (Shippegan) sound, between Shippigan island on the east and Pokesuedie island and the mainland on the west, is ex-

tensive, the sound proper being nearly 3 miles long north and south and 2 miles broad.

Little Alemek bay, on the northeastern side of Shippigan sound, is shallow, but there is good anchorage off its mouth.

Alemek bay, the next bay southward of Little Alemek bay, is an excellent harbor with 3 to 4 fathoms water, and secure in all winds. On Alexander point, the northern part of the bay, is a windmill. Alemek village and church are at the head of this bay; it is a fishing settlement from which large shipments of fish are annually made.

There is a wharf at Alemek 990 feet long, with a depth of $9\frac{3}{4}$ feet at its outer end at low water.

A bar of mud and sand extends across the sound from Alexander point to Brulé point, which limits the depth that can be carried into Alemek bay and into Shippigan harbor to $2\frac{1}{2}$ fathoms at low water.

Shippigan harbor.—On the mainland, nearly opposite Paint point, the southern point of Alemek bay, is Bernache point, on which is a windmill and which is the sandy northern point of Basse bay, the latter being small and shallow. On the southern point of Basse bay and $\frac{3}{4}$ mile southward of the windmill, stands Shippigan village and church; and off them is Shippigan harbor, which is a narrow channel, with 2 to 4 fathoms water, between shoals of mud and eel-grass nearly dry at low tide. This narrow channel continues $2\frac{1}{2}$ miles beyond the church, terminating at Shippigan gully, the southern entrance of the sound. Shippigan harbor is quite secure in all winds, and most of the vessels which visit the place for timber moor there. The watering place is at a small stream in Basse bay a short distance westward of the church.

The terminal station of the Caraquet railway is at Shippigan.

Buoys.—The channel leading to the harbor, and the harbor itself, are buoyed with red and black buoys.

Caribou bay.—Almost opposite Shippigan village is Caribou point. Caribou bay and cove extend eastward from the point for 1 mile, and southeastward to Shippigan Gully point, the southern point of Shippigan island. With the exception of a very narrow and intricate channel the bay consists of sand, mud, and weeds, nearly dry at low water.

Simon inlet, which is the best harbor in Shippigan sound, is on the western side of the sound, and within its entrance between Brulé and Marcelle points there is landlocked anchorage in 4 to $4\frac{1}{2}$ fathoms, with sufficient space for large vessels.

Ice.—The sound is usually frozen over about December 1 and clear of ice about May 10, being completely closed between those dates. The first vessel arrives from sea about May 21, and the last one leaves

about November 13. In 1876 field ice drifted into Shippigan sound on May 14 and did not disappear until June 4.

Shippigan channel leading into the sound from the northward is deep, but the passage is narrow and crooked, and without leading marks; therefore the channel is difficult. Between Pokesuedie and Shippigan shoals, which are exceedingly steep for a distance of 3 miles, the breadth of the channel is only 500 to 800 yards. The whole distance from Shippigan flat to Shippigan church is about 8 miles.

Buoys.—A black buoy is moored in 3 fathoms on the outer edge of the shoal extending from Skait point, the western point of Shippigan island, and with that point bearing 96° , distant $1\frac{1}{2}$ miles. A red buoy is moored on the western side of Shippigan channel with Pokesuedie lighthouse bearing 206° , distant $1\frac{3}{4}$ miles; a similar buoy is moored on the same side of the channel with the lighthouse, bearing 282° , distant 1 mile.

The channel leading to Shippigan harbor is marked by buoys and stakes, red marks being left on the starboard hand, and black marks on the port hand, entering from the northward, as far southward as the government wharf.

Directions.—Approach the channel with Marcelle and Pokesuedie points in line, 179° . After passing the western end of Shippigan flat the depth is 7 fathoms in the channel, but it decreases as Pokesuedie shoal is neared. When Goose Lake lighthouse bears 66° , steer so as to leave the black buoy off Skait point on the port hand, and the red buoy on the northeastern end of Pokesuedie shoal on the starboard hand. Then steer toward Marcelle point until the northern extreme of Pokesuedie island bears 268° , when alter course so as to leave the red buoy southeastward of the lighthouse on the starboard hand. A 179° course then leads direct to Shippigan harbor entrance; and in proceeding up the channel to the harbor leave the red buoys and marks on the starboard hand and the black buoys and marks on the port hand, southward to the government wharf. As the shoals have not been examined for some time caution is necessary, especially in a vessel drawing 12 feet or more.

Tides and tidal streams.—It is high water, full and change, in Shippigan harbor at 3h. 42m.; springs rise $5\frac{1}{2}$ feet, neaps 3 feet. The rate of the tidal streams seldom exceeds 1 knot even in Shippigan channel, where, of course, they are stronger than elsewhere. In Shippigan harbor the stream is regular in fine weather, running in at the gully, and northward through the sound into Chaleur bay, from about half ebb to half flood on the shore, and in the reverse direction or southward from about half flood to half ebb.

These tidal directions are not complete, as the data obtained during the comparatively short time occupied by the survey were not full.

Storm signals are shown at Shippigan.

Caraquet island, which lies westward about 3 miles from Pokesuedie island, is of sandstone, low and wooded, and is $1\frac{3}{4}$ miles long west and east. Sandy points extend from both ends of the island toward the mainland so as to form a bay, in which there is landlocked anchorage in 17 to 6 feet water. The island rises from an extensive bank of flat sandstone, partly covered with sand, and, commencing at the entrance of Shippigan sound, extends westward to Mizzenette point, a distance of about 8 miles. There is no passage for shipping between Caraquet island and Mizzenette point, the western point of Caraquet bay, situated westward nearly 3 miles from the island; but near the island there is a narrow channel for boats or very small craft.

Light.—A square, white lighthouse on a dwelling, 43 feet high, on the western side of Caraquet island, exhibits at 49 feet above high water a fixed white light, which should be seen in clear weather a distance of 14 miles.

Caraquet shoal extends $4\frac{1}{4}$ miles east-northeastward of Caraquet island, from which it dries to the distance of 2 miles, and is shallow in every part. From its eastern end, Caraquet church steeple and the southeastern end of the trees on Caraquet island are in line, bearing 243° . Shippigan church in line with Pokesuedie point, bearing 159° , leads close eastward of the shoal in 3 fathoms. A vessel requiring deeper water should pass farther to the eastward by keeping Marcelle and Pokesuedie points in line, bearing 179° .

Caraquet (Caraquette) channel, between Pokesuedie and Caraquet shoals, forms the entrance to Caraquet harbor for a distance of $2\frac{1}{2}$ miles, and has water enough for vessels of heavy draft, but it is crooked, and only 450 yards wide between very steep shoals.

Caraquet harbor commences immediately within, or to the westward of Pokesuedie island, and extends westward between the mainland and Caraquet shoal and island. The houses and fish stores of Lower Caraquet are on the mainland nearly opposite the island, and Upper Caraquet church stands conspicuously on a ridge about $2\frac{1}{2}$ miles farther westward. In the eastern part of the harbor, immediately within Pokesuedie, there is a depth of 5 to 6 fathoms, and there is not less than $3\frac{1}{2}$ fathoms till within $\frac{1}{2}$ mile of the southeastern point of Caraquet island. The channel between the island and the mainland is only 250 yards wide and carries $2\frac{1}{2}$ fathoms water, but farther westward it increases to $\frac{1}{4}$ mile wide and $4\frac{1}{2}$ fathoms water, and is there sheltered by Mizzenette sands, which dry at low water from

Mizzenette point nearly across to Caraquet island. The bottom is of mud in Caraquet harbor, and of sand in Caraquet channel.

Caraquet is an excellent harbor for vessels of moderate draft, and it is even capable of affording anchorage to large vessels; yet caution is necessary in navigation, as its approach is between shoals extending several miles from the shore, and the channel is very narrow and steep-to. A depth of 23 feet can be carried in at low water sufficiently far for vessels to be anchored in safety in that depth.

Caraquet bay extends $4\frac{1}{2}$ miles westward within Mizzenette point and is shoal except the narrow channel containing the harbor. Two shallow rivers, the South and the North, in the mouths of which there are oyster beds, flow into the bay. The best watering place is at a small stream, which descends the steep banks of the harbor near Brideau point.

Caraquet range lights.—A square white lighthouse, 30 feet high, situated on the mainland 128° , a little more than 1 mile from Sandy point of Caraquet island, exhibits at 31 feet above high water a fixed white light, which should be seen in all directions seaward in clear weather a distance of 10 miles.

A similar lighthouse, 45 feet high, situated 227° , 1,267 yards from the preceding lighthouse, exhibits at 70 feet above high water a fixed white light, which should be seen in clear weather on the range line a distance of 10 miles.

These lights in line, 227° , lead into Caraquet harbor through Caraquet channel. The alignment should be taken at the red buoy moored in the junction of Caraquet and Shippigan channels and kept until the black buoy, $1\frac{1}{6}$ miles outside the front light, is abeam, whence the course up the harbor is 247° .

Buoys.—Caraquet channel and harbor are marked by four red can buoys, which are left on the starboard hand entering, and by three black can buoys, which are left on the port hand.

Ice.—Caraquet harbor is usually frozen over about December 11 and is clear of ice about May 8, being completely closed between those dates. The first vessel arrives from sea about May 12 and the last one leaves about November 25.

Tides.—It is high water, full and change, in Caraquet harbor at 2h. 40m.; springs rise 6 feet, neaps 3 feet.

Directions.—Winds from west-northwest, through north, to southeast, are fair for entering Caraquet harbor. From the northeastward and about 2 miles northwestward of North point of Miscou, steer southwestward, in not less than 8 fathoms water, till Marcelle point, the wooded southern end of Pokesuedie island, is in line with Pokesuedie Point lighthouse, bearing 179° ; keep this

range and pass $\frac{1}{2}$ mile westward of the northwestern end of Shippigan flat until the leading lighthouses at Caraquet are in line, 227° . Keep these lighthouses in line through Caraquet channel, leaving the black buoys on the port hand, until nearly abreast the black buoy situated nearly $1\frac{1}{6}$ miles seaward of the front lighthouse, when alter course to 247° for the anchorage, using the chart as a guide.

From the westward, in a large vessel, pass northward of Fisherman ledge, not going southward into less than 6 fathoms at low water, and when Marcelle point and Pokesuedie Point lighthouse are in line, bearing 179° , proceed as before directed. A small vessel may pass through Fisherman channel, and when Shippigan church is in line with Pokesuedie point, bearing 156° , she may keep that range on and steer over the tail of Caraquet shoal in 3 fathoms; as soon as the lighthouses at Caraquet are in line, 227° , she may proceed as above directed.

Caraquet village, on the southern side of the harbor, is a thriving fishing settlement, and Upper Caraquet, about 3 miles farther westward, where there is a station of the Caraquet railway, is a place of shipment for oysters and flour.

The population is about 4,074.

Storm signals are exhibited at Caraquet.

Wharves.—A wharf, 1,200 feet long, with an L 100 feet long at the outer end, where there is a depth of 6 feet, extends from the watering place about 800 yards eastward of Brideau point.

A wharf, 1,700 feet long, is constructed at Caraquet, and there is a depth of 22 feet at low water alongside its outer part for a length of 300 feet.

The wharves are for the shipment of lumber manufactured in the locality.

There is a landing and shipping wharf at Upper Caraquet.

Mizzenette ledge of rocks, with 5 feet least water over it, lies on the western part of Caraquet bank and near its northern ridge, with Caraquet Island lighthouse bearing 134° . $1\frac{1}{4}$ miles. Donax point, just open northward of Mizzenette point, bearing 263° , leads northward of it, in $3\frac{1}{2}$ fathoms. This mark also leads along the northern edge of Caraquet bank eastward nearly to Scollop patch, which has 14 feet least water over a rocky bottom, and from which the northwestern end of Caraquet island and Caraquet church are in line, the southeastern end of the island bearing 184° , distant nearly 2 miles. The mark for clearing the northern edge of Caraquet shoal to the eastward of Scollop patch, and in 3 fathoms water, is the southern end of Miscou island, well open northward of the northern point of Shippigan island, bearing 77° . As these marks are low and distant and

often not well defined, they should not be trusted, but the northern edge of the shoal should not be approached to a depth less than 4 fathoms at low water.

Fisherman ledge is a detached bed of rocks, with 10 feet least water, lying northward of Caraque bank, and separated from it by Fisherman channel, which is 1 mile wide and carries 4 to 7 fathoms water. The ledge, for which there are no clearing marks, is $1\frac{3}{4}$ miles long, east-northeast and west-southwest, and 600 yards wide between depths of 3 fathoms. Its northern edge is 3 miles distant from Caraque island, and its eastern and western ends bear 0° from the corresponding points of the island. The points of cliff at Grande Anse and Donax point in line, bearing 259° , leads through Fisherman channel; but this channel has not been closely examined, and is not recommended for large vessels.

The shore of the bay from Mizzenette point to Bathurst harbor, a distance of 29 miles, is for the most part sandstone cliffs, 100 to 200 feet in height, but is composed of very low sand hills near Mizzenette point, where there is a landing wharf, 500 feet in length. About 3 miles westward of that point, where the sandy cliffs commence, shoal water extends rather more than $\frac{1}{2}$ mile from the shore, but generally it does not extend more than 500 yards, and, with care, the coast may even be approached by the lead to 10 or 12 fathoms, the greater depth being quite near enough at night. There are settlements all along the coast, and villages and fishing establishments at Grande Anse and Pokeshaw.

Grande Anse, 8 miles westward of Mizzenette point, is a fishing settlement of 700 to 800 inhabitants, possessing a church and a station of the Caraque railway. A boat harbor has been formed by a breakwater into the bay. At Pokeshaw, 11 miles westward of Mizzenette point, there is a little bay where boats shelter and a small river, also a railway station.

Grindstone point, where there is a breakwater, 750 feet long, affording shelter to small fishing craft and schooners engaged in the export of grindstones, etc., is nearly 16 miles westward of Mizzenette point. The place, near which there is a station of the Caraque railway, is known as Clifton (Stonehaven.)

Light.—A square white lighthouse, 37 feet high, situated at the shore end of Stonehaven breakwater at Grindstone point, exhibits, at 88 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 15 miles.

The coast from Grindstone point continues west-southwestward for $9\frac{1}{2}$ miles to Salmon (Belloni) point, which is on the eastern side of Bathurst harbor entrance.

Norton shoal, $\frac{3}{4}$ mile offshore, 1 mile westward of Norton point, which is $3\frac{1}{2}$ miles westward of Grindstone point, has a depth of 3 fathoms over it, and is the only detached danger from Mizzenette point to Bathurst harbor.

Light.—A square white lighthouse, 22 feet high, on Salmon point, exhibits, at 30 feet above high water, a fixed white light, which should be seen from all points of approach by water, in clear weather, a distance of 10 miles.

Bathurst harbor, at the mouth of Nipisiguit river, is 400 yards wide at the entrance between Carron point, which is $2\frac{1}{2}$ miles westward of Salmon point and Alston point; both these points are sand, with stores and buildings upon them.

There is a bar at the entrance of the harbor, and the narrow channel over it has a depth of 7 feet at low water springs at its shoalest part. The distance from outside the bar in 3 fathoms to the entrance of the river is $1\frac{1}{2}$ miles, and for the whole of that distance the very narrow channel runs between sandy shoals, nearly dry at low water, and extending from both sides of the river's mouth.

Within the entrance there is an extensive and well sheltered basin nearly 3 miles long and 2 miles wide, but nearly all dry at low water, excepting the channels of four rivers, which, after uniting their streams below Bathurst, flow to the entrance by Main channel. On the eastern side of the basin there is an islet called Indian or Bathurst islet.

One-half mile westward of the town, and northward of the mouth of Middle and North rivers, is Peter point, with its church and village of Acadian French. On the northern side of Peter point Tetagouche river enters a bay on the northwestern side of the basin. None of these streams are navigable for any distance; even the Nipisiguit, which is by far the largest and a very considerable river, ceases to be navigable $1\frac{1}{2}$ miles above Bathurst, where the tide ends and rapids begin.

Range lights.—A square white lighthouse, 33 feet high, on Carron point, exhibits, at 31 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 10 miles.

A square lighthouse, painted red and white in stripes, situated 207° . 120 yards from the preceding lighthouse, exhibits, at 43 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 8 miles.

NOTE.—The lighthouses on Carron point in line now lead to the westward of the outer bar buoy, shoals having extended eastward since the lighthouses were moved.

Buoys.—There is a black buoy moored in 7 fathoms water about 1 mile northeastward of the outer bar buoy. The outer end of the

channel over the bar is marked by a red conical buoy, which is now moored to the eastward of the alignment of the range lights, and must be left on the starboard hand entering. Between this buoy and Carron point the channel is marked by a red cask buoy, a black cask buoy, and a red conical buoy. Inside the point the eastern and western channels in the harbor are marked by cask buoys and by casks set on clusters of piles, colored according to the Canadian system of buoyage.

Anchorage.—Vessels usually moor, to load timber, just outside the entrance between the sandy points where there are 3 to 4 fathoms water sheltered by the bar and the sandy shoals on either side. Some smaller vessels load within the entrance and some larger ones complete loading outside the bar, where the anchorage in 6 to 7 fathoms, mud bottom, is considered safe in summer, although northeasterly gales send in a heavy sea.

Directions.—Local knowledge is necessary to enter Bathurst harbor, and the bar should not be attempted without a pilot. A depth of 14 feet at high water springs can be carried up to the town wharf, and in Main channel there are several places where vessels lie afloat and load in 14 feet at low water.

Pilots.—There are good pilots whose services are absolutely necessary for Bathurst harbor.

Tides and tidal streams.—It is high water, full and change, at Bathurst at 3h. 15m.; springs rise 7 feet, neaps 4 feet. The rate of the tidal streams in Main channel is about 2 knots, and over the bar about $1\frac{1}{2}$ knots. The streams set fair in and out, and over the bar.

Bathurst, the shire town of the county of Gloucester, having a population of about 1,500, is well situated at the head of the basin described above, $2\frac{1}{2}$ miles within its entrance, and on the point which divides Nipisiguit river from North and Middle rivers. It is a lumber port, but the salmon fishery is carried on extensively. There is a seamen's hospital.

Communication.—There is a station of the Intercolonial railway at Bathurst, which is also the western terminus of the Caraquet railway. The town has telegraphic communication.

Storm signals are exhibited at Bathurst.

Wharf.—At Bathurst there is a wharf, 174 feet long, having a depth of 7 to 10 feet at low water along its channel side and outer end.

The coast from Alston point to Dalhousie point is low and composed of sandstone, limestone, and trap rocks. From Alston point it trends north-northwestward, and at $8\frac{1}{2}$ miles distance is Rochette village and church; 8 miles farther in the same direction is Belledune point, which is low and sandy. Little Belledune point is 3 miles

west-northwestward of Belledune point. Between Alston and Little Belledune points shoal water extends generally from about $\frac{3}{4}$ to $\frac{1}{2}$ mile offshore, which should not be approached in a vessel of heavy draft to a depth of less than 10 fathoms, especially at night.

Petit Rocher, $1\frac{1}{2}$ miles northward of Rochette, is a farming, fishing, and lumbering settlement. A breakwater is constructed here.

Lights.—A square white lighthouse, 31 feet high, at Petit Rocher, on Elm Tree point, exhibits, at 36 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 12 miles.

A white octagonal tower, 55 feet high, having sloping sides, and surmounted by a red circular lantern, on Little Belledune point, exhibits, at 62 feet above high water, a fixed white light, varied by a white flash every 30 seconds, that should be seen in clear weather from all points of approach 13 miles.

The coast from Little Belledune point takes a westerly direction for 9 miles to Black point. Shoal water extends generally $\frac{3}{4}$ mile off the coast, but it is reported to extend $1\frac{1}{2}$ miles northward of the entrance of Jacquet river, which lies $5\frac{1}{2}$ miles westward of Little Belledune point. The coast should not be approached in a large vessel to less than 10 fathoms.

Anchorage.—There is anchorage in 4 fathoms, mud, in the bay of Nash river, with Black point bearing 293° , distant 1 mile; and although the anchorage is open to easterly winds, the bottom is good holding ground, and the anchorage is considered safe in summer.

Heron island, the southeastern point of which lies 354° , 1.6 miles from Black point, is 4 miles long, northwest and southeast, with a width varying from a narrow neck to 1 mile; it is moderately high and wooded, and its northeastern shore generally is composed of red sandstone cliffs, about 40 feet in height. Shoal water extends $\frac{3}{4}$ mile off its southeastern point, and the 3-fathom curve is $\frac{1}{2}$ mile off the northeastern side of the island; shoal water also extends $\frac{3}{4}$ mile northwestward of its northwestern point.

Light.—A square, white lighthouse, 20 feet high, on the northeastern side of Heron island, 1.3 miles from its southeastern end, exhibits, at 66 feet above high water, a fixed white light, which should be seen in clear weather a distance of 15 miles.

Buoys.—A black can buoy is moored in 4 fathoms with the southeastern point of Heron island bearing 280° , distant 1,400 yards, and Heron Island lighthouse bearing 302° .

A red spar buoy is moored in 3 fathoms with the northwestern end of Heron island bearing 101° , distant $\frac{1}{2}$ mile.

Heron channel, between Heron island and the mainland, has a least depth of 3 fathoms in it, but its width is reduced in some places

to a little more than 200 yards by the shoals which extend off both sides.

Heron rock, small, with 6 feet water on it and 4 to 5 fathoms close around, lies nearly in mid-channel with the southeastern end of Heron island bearing 44° , distant a little more than 1 mile. A rock, almost always above water, lies 600 yards westward of Heron rock; it is bold and on the edge of the shoal off the mainland.

Buoy.—A red can buoy is moored on Heron rock and must be left on the starboard hand by vessels passing through to westward.

To clear Heron rock, pass from 200 to 400 yards eastward of the rock that is generally above water, leaving Heron Rock buoy on the starboard hand when standing through to the westward. Heron channel is intricate and dangerous for a vessel of any size, and a good pilot is necessary.

The coast from Black point trends west-northwestward for 11 miles, when it turns northward for about $2\frac{3}{4}$ miles to Bon Amie point, the southern entrance point of Restigouche river. There is good anchorage in 4 fathoms, mud, westward of Heron island, and nearly midway between it and Charlo river. This river, the entrance to which bears 247° , $3\frac{1}{4}$ miles from the northwestern point of Heron island, admits only boats. In 1882 a heavy lumber boom was moored across the river. The sandy beach toward the head of Chaleur bay may be safely approached to the depth of 7 fathoms.

Bon Amie rocks extend nearly 800 yards southeastward from a point situated $\frac{1}{4}$ mile southwestward of Bon Amie point; they are steep, high, rough, and broken.

Shoal water of less than 5 fathoms extends 300 yards southeastward of Bon Amie rocks, and continues to about $\frac{1}{4}$ mile northeastward of Bon Amie point, and thence to Dalhousie island.

Light.—A square white, lighthouse, 33 feet high, on Bon Amie point, exhibits, at 49 feet above high water, a fixed white light, which should be seen in clear weather a distance of 13 miles.

Restigouche river entrance lies between Bon Amie rocks and Maguacha point, on the Quebec side, where there are steep, red sandstone cliffs, which bear 70° , distant 2 miles from the rocks.

Maguacha spit, of sand and stones with only 6 feet over it at low water, runs westward nearly 1 mile from Maguacha point, or toward Bon Amie rocks, thus occupying half the channel; its southwestern extreme is steep-to.

Clearing marks.—The highest summit of mount Scaumenac (1,745 feet high) open southwestward of Dalhousie island leads southwestward of the spit. The southern side of the spit is cleared by keeping the southern extreme of mount Carleton (1,830 feet high) open southward of Maguacha point.

Buoy.—A red conical buoy is moored in $2\frac{1}{2}$ fathoms at the end of Maguacha spit, with Maguacha point bearing 68° , distant about 1,800 yards.

Dalhousie harbor.—Dalhousie island (locally Douglas island), 1,600 yards northwestward of Bon Amie point, is 400 yards long, high and rocky, round backed, wooded, and joined by a shoal which dries, to the low point of Dalhousie, situated 200 yards southwestward. On that point there are large storehouses belonging to Dalhousie town, which is on the side of a hill to the southwestward of the island. Six hundred yards westward of Dalhousie island there is a small rocky peninsula, named Montgomery island, at the end of a narrow sandy spit, forming the western side of the small and shallow bay of Dalhousie. Shallow water extends from the island to the peninsula, continuing to the westward, but between this shallow water and the flats to the northward is a space about 1 mile long and from 300 to 600 yards wide and carrying from 4 to 7 fathoms water. This is Dalhousie harbor, where timber vessels moor, and which is quite secure in all winds.

The harbor may be approached either through the direct channel, 300 yards wide, between Middle ground and Dalhousie island, or round to the northward and westward of Middle ground, which latter route involves passing over a flat of 3 fathoms at low water. The narrow channel has good leading marks and carries 6 fathoms water.

Lights.—An octagonal, white lighthouse, 53 feet high, with a red lantern, on the northern end of Dalhousie island, exhibits, at 63 feet above high water, a flashing white light, showing 1 flash every $7\frac{1}{2}$ seconds, which should be seen in clear weather a distance of 13 miles.

Railway Wharf range.—A square, white lantern, 34 feet high, with a red top which projects through the roof of the railway freight shed, near the outer end of Dalhousie Railway wharf, exhibits, at 30 feet above high water, a fixed white light, which should be seen in clear weather, on southwesterly bearings and also when in line with Montgomery Island light, a distance of 9 miles.

A square, white lighthouse, with a red roof, 22 feet high, on the summit of Montgomery island, exhibits, at 34 feet above high water, a fixed white light, which should be seen in clear weather, when in line with the Railway Wharf light, a distance of 9 miles.

Montgomery Island lighthouse bears 137° , distant 99 yards from the Railway Wharf lighthouse, and the two in line lead to the Railway wharf, clear of all shoals.

Middle ground, separated from Dalhousie island by the narrow harbor channel, is 1,100 yards long, north and south, and 800 yards wide. It is of sand and stones, and had a depth of 6 feet least water over it, but it is reported to have shoaled; it is very steep on its east-

ern side. The main channel between this shoal and the shore to the northward and eastward is about 1,300 yards wide, with depths of 6 to 15 fathoms water.

The rate of the tidal streams, which are stronger in this channel than elsewhere, does not exceed 2 knots.

Buoys.—A black can buoy is moored in $2\frac{1}{2}$ fathoms water on the northeastern part of Middle ground.

A red spar buoy is moored on the southeastern edge of Middle ground.

Anchorage.—The best anchorage in Dalhousie harbor is in $6\frac{1}{2}$ or 7 fathoms, with Dalhousie island and Bon Amie point in line. A third-class cruiser has anchored in about $4\frac{1}{2}$ fathoms with the Railroad wharf bearing 209° , distant $\frac{1}{4}$ mile.

Tides and tidal streams.—It is high water, full and change, in Dalhousie harbor at 3h. 10m.; springs rise 9 feet, neaps 6 feet. The rate of the tidal streams in the entrance does not exceed 2 knots.

Pilots can be obtained at Dalhousie for Restigouche river.

Ice.—The harbor is usually frozen over about December 5, and clear of ice about April 15, being completely closed between those dates. The first vessel arrives from sea about May 14, and the last one leaves about November 11.

Directions.—To enter Restigouche river and Dalhousie harbor: From midway between Heron island and Tracadigash point steer about 270° for Dalhousie hill (715 feet high). When about $1\frac{1}{2}$ miles to the eastward of Maguacha point, bring the highest summit of mount Scaumenac open southwestward of Dalhousie island, and keep this range steering southwestward of Maguacha spit, the buoy on the end of which is difficult to keep in position and therefore must not be implicitly trusted. Keep this range on until the southeastern end of Bon Amie rocks bears about 231° and is distant about $\frac{1}{2}$ mile. Then steer about 321° until the Railroad wharf opens northward of Dalhousie island, when steer westward into the harbor by the narrow channel southward of Middle ground, leaving Dalhousie island to the southward at a distance of about 200 yards, and the buoy on the southeastern edge of Middle ground about 100 yards to the northward.

To take the more roomy route northward of Middle ground, when the Railroad wharf opens northward of Dalhousie island, steer about 337° till Montgomery Island lighthouse bears 219° , leaving the black buoy on the northeastern part of Middle ground to the westward. Then steer 270° till Dalhousie old church, which has a cupola but is not conspicuous, is in line with the Roman Catholic church, which has a spire. 171° ; keep this range on, steering over the extensive 3 fathoms flat to the westward of Middle ground, into the harbor.

When beating in and standing northward toward Tracadigash spit keep Dalhousie hill open southward of Maguacha point. Westward of the spit vessels may stand in to 6 fathoms water, but there is no use in standing in to Carleton or Nouvelle bay out of a favorable tide. Toward Heron island, the highest summit of mount Scaumenac, open northward of Dalhousie island, clears the shoal water northward of Heron island in 4 fathoms. Tack, therefore, in the board to the southward when the mountain comes in line with the northern side of the island, or by the lead in 6 fathoms. Clear the reef off the western end of Heron island by keeping Charlo river bearing eastward of 180° . Vessels may then stand southward into 4 fathoms, so long as the eastern side of Maguacha point bears northward of 11° , after which tack in the board to the southward in 7 fathoms, because the flat of $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms in Eel bay becomes rather steep about $1\frac{1}{2}$ miles from Bon Amie rocks.

Bon Amie rocks may be approached to 7 fathoms of water, and when they bear 236° the vessel is within the point of Maguacha spit, for which clearing marks have been given. From Bon Amie rocks to Dalhousie island a vessel may stand southwestward into 8 fathoms, but the eastern side of Middle ground should not be approached to less than 10 fathoms, and that with caution, for it is very steep; its northern side may be approached to 9 fathoms. Toward the northeastern shore a vessel may stand in to 9 fathoms between Maguacha spit and Yacta point, which point has a very steep shoal off it for 600 yards, and from Yacta point to Fleurant point a vessel may safely stand northward into 6 fathoms.

Dalhousie, the shire town of Restigouche county, has a population of about 800 inhabitants. It is a lumber port from which nearly nineteen million superficial feet of lumber were shipped in 1901. It has also a trade in canned salmon and lobsters.

Communication.—The Intercolonial railway has a station at Dalhousie, and there is a telegraph office.

Storm signals are exhibited at Dalhousie.

Supplies.—Fresh provisions can be obtained at Dalhousie.

Restigouche river, from its entrance between Bon Amie and Maguacha points to the distance of 14 miles up, where islands, shallows, and rapids terminate navigation, excepting to canoes or bateaux, is an estuary or inlet of the bay with a breadth varying from $1\frac{1}{2}$ to 3 miles. At the above distance within its entrance, and on the southern shore at the foot of the Sugarloaf, a remarkable conical hill 950 feet high, is Campbellton. Between Campbellton and Indian point, on the northern shore, the breadth of the estuary is only $\frac{1}{2}$ mile, but it expands again to $1\frac{1}{2}$ miles at its head just below the islands. At Indian point, a mile above Campbellton, navigation for shipping ends,

there being only 12 feet in a narrow channel at low water; but small craft ascend through very narrow passages, on either side, carrying 6 to 9 feet water, to within $\frac{3}{4}$ mile of the head of the estuary, where Restigouche river proper enters it through narrow channels between the islands, 21 miles from the head of Chaleur bay.

There is a shallow part of the channel called the bar, over which there is a depth of 13 to 14 feet at low water, off Loup river, which enters a bay in the northern shore 2 miles below Campbellton; but vessels of moderate draft ascend at high water to Campbellton, off which they moor in 3 to $3\frac{1}{2}$ fathoms at low water. Vessels of 18 feet draft ascend at all times of the tide nearly to Oak point, which is about $11\frac{1}{2}$ miles up, and within 1 mile of the bar; vessels of greater draft proceed nearly to Garde point, which is about 8 miles above the entrance. The depth of water has, however, been increased in places by dredging.

A pilot is not necessary to enter the inlet as far as the anchorage off Fleurant point, on the northern shore, but to proceed farther up a pilot is required, for there are no good leading marks, the shoals become too steep for the lead to give sufficient warning, and the channels are narrow.

The scenery of the valley of the Restigouche compares favorably for grandeur and picturesque beauty with that of any other part of the gulf of St. Lawrence. On the northern or Quebec side of the estuary, at a distance of 2 to 3 miles from the shore, the mountains rise 1,000 to 1,745 feet above the sea; on the southern or New Brunswick side the wooded hills or ridges are much lower, although still of considerable elevation, the highest points being the Sugarloaf, 950 feet, and Dalhousie hill, 715 feet above the sea. There are magnificent cliffs, 200 feet high, of variegated sandstones and conglomerates; the sandstones and shales often containing vegetable remains and traces of coal. Limestones, sometimes curiously altered by trap rocks, at others abounding with organic remains, are occasionally met with, as also are trap rocks, abounding with zoolites, jaspers, cornelians, and agates. These last-named minerals, together with fragments of petrified wood, are found among the pebbles of the beaches more or less all over Chaleur bay, and especially at Paspébiac. They are known at Quebec by the name of Gaspé pebbles, and they are worked up into ornamental articles of jewelry.

Anchorage.—The most convenient anchorage for vessels visiting the Restigouche for supplies of wood or water is anywhere off Fleurant point, on the northern shore, and about 2 miles northward of Dalhousie harbor, in 6 or 7 fathoms at low water, where a vessel can weigh in all winds and at all times of tide.

Water.—There is a tolerably good watering place at a brook $\frac{1}{2}$ mile westward of Fleurant point.

Mussel bank, a reef, extends out from the high cliffs, nearly half way across the estuary, about 1,600 yards above Fleurant point.

Gas buoys.—The following steel cylindrical buoys, surmounted by pyramidal steel frames supporting lanterns which exhibit intermittent lights, are moored in the position given.

A black buoy showing red light off Fullerton's bar, Scaumenac point, in 22 feet, on northern side of channel.

A red buoy showing white light, in 26 feet water off Lalime (Lanin) point, southern shore.

A red buoy showing white light, in 31 feet water, off Garde point, northern shore.

A red buoy showing white light, in 15 feet water, off Battery point, northern shore, on western point opposite Traverse bar.

A red buoy showing white light, in 14 feet water, in mid-channel opposite the sand bar westward of Oak point, northern shore.

Lightvessel.—A small lightvessel, with "Garde point No. 6" painted on her sides, is moored on the northern side of the main channel off Garde point, and exhibits, at 18 feet above water, a fixed white light, which should be seen, in clear weather, up and down stream, a distance of 8 miles.

Range lights—Oak Point range.—A square white lighthouse, 22 feet high, situated near the western end of Oak point, on the left bank of the estuary about $3\frac{1}{4}$ miles above Garde point, exhibits, at 52 feet above high water, a fixed white light, which should be seen, in clear weather, on, and over a small arc on each side of the range line, a distance of 12 miles.

A similar lighthouse, on a hill at 45° , 744 yards from the preceding lighthouse, exhibits, at 121 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 12 miles.

Campbellton range.—A square white lighthouse, 22 feet high, on the pier beside the railroad wharf at Campbellton, on the right bank of the estuary about 3 miles above Oak point, exhibits, at 24 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 9 miles.

A similar lighthouse, 37 feet high, on Kilgour Shives wharf, at 241° , 412 yards from the preceding lighthouse, exhibits, at 39 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 9 miles.

In proceeding up the river through the northern channel on a westerly course, when about 700 yards above Oak point, the range lighthouses on that point in line, bearing 45° , astern, lead diagonally across the river to the alignment of Campbellton range lighthouses 241° , which alignment leads up to Campbellton wharves.

Tides.—It is high water, full and change, at Campbellton at 4h. 0m.; springs rise 10 feet, neaps 7 feet.

Campbellton, the northern town of the province of New Brunswick, 12 miles westward of Dalhousie, is an incorporated town of 2,652 inhabitants, and is a lumber port from which over 24,000,000 superficial feet of lumber were shipped in 1902.

There is a wharf with a frontage of 250 feet and a depth of 12 feet alongside it at low water.

Communication.—The Intercolonial railway passes through Campbellton, where there is a station.

The United States is represented by a consul and a vice and deputy consul.

QUEBEC.

Tracadigash point bears 79° , 7 miles from Maguacha point, and in the northwestern corner of the bay between them are Nouvelle basin and river, which are nearly dry at low water.

Carleton road, an excellent and capacious anchorage, safe in all winds, is situated on the western side of Tracadigash point, which consists of sand, inclosing a shallow lagoon, capable of admitting boats, or very small craft, at high water. On the northern shore of this lagoon stand Carleton village and church, the former extending westward to the shore of the bay, where the sand beach of the lagoon joins the mainland. This village is in a most picturesque situation, and it is in great repute as a watering place for shipping.

There is a station of the Atlantic and Lake Superior railway at Carleton.

Wharves.—A pier 234 feet long, with an average depth of 10 feet at its outer end at low water springs, extends from the shore of Carleton road about $\frac{3}{4}$ mile northward of Tracadigash point.

A government wharf has been constructed near the point where the narrow peninsula inclosing the lagoon on its western side meets the mainland. From the outer end the wharf trends shoreward 74° . At the outer end the wharf is $39\frac{1}{2}$ feet wide and carries that width for a length of 140 feet; from that point for 200 feet farther to the shore the wharf is 22 feet wide.

A small stream, with a bridge across it, enters the northwestern corner of the lagoon, and 1 mile farther westward, near the commencement of the clay cliffs, is another small stream, which is the watering place. Immediately in rear of the village mount Carleton rises abruptly 1,830 feet above the sea, and the hills of the range trend from it both northward and westward for many miles.

Lights.—A square white lighthouse, 28 feet high, on Tracadigash point, exhibits, at 32 feet above high water, a fixed white light, which

should be seen, in clear weather, a distance of 12 miles. The light is obscured over the anchorage.

A square white lighthouse, 20 feet from the outer end of the government wharf above mentioned, exhibits, at 20 feet above high water, a fixed red light, that should be seen, in clear weather, from all points of approach by water a distance of 6 miles.

Fog signal.—A hand horn at Tracadigash Point lighthouse answers vessels' signals.

Anchorage.—There is anchorage anywhere in Carleton road in 5 to 6 fathoms, but it must be remembered that although the sandy beach of Tracadigash point is quite bold on its western side within the spit, yet shoal water extends nearly $\frac{1}{2}$ mile off the mainland. The best berth, especially with easterly winds, is in $5\frac{1}{2}$ fathoms, mud, with Tracadigash point bearing 141° and Carleton church steeple 77° .

Tides.—It is high water, full and change, at Tracadigash point at 3h. 0m.; springs rise 8 feet, neaps 5 feet. The rate of the tidal streams in Carleton road seldom exceeds 1knot.

Tracadigash sand spit runs $\frac{1}{2}$ mile south-southwestward from Tracadigash point.

Buoy.—A red can buoy is moored in 21 feet at low water, at the southern end of Tracadigash spit.

Directions.—Maguacha point and Dalhousie hill summit in line, bearing 262° , leads close to the end of the spit in 3 fathoms. Therefore to clear the spit keep the hill well open, or at night do not go into less than 10 fathoms water. When Carleton church steeple is in line with the southwestern extreme of Tracadigash point, bearing 32° , which leads northwestward of the outer end of the spit, haul in to the northward, not going into less than 7 fathoms till the point bears to the southward of 67° .

Cascapediac bay, which lies between Tracadigash point and Black point, bearing 81° , $12\frac{1}{2}$ miles, is 5 to 6 miles deep. Flowing into its head is Cascapediac river, a considerable stream, which can be entered only by boats, in consequence of the extensive shoals of sand and mud, which dry out 2 miles from its entrance, and occupy all the head of the bay. Black point, the eastern point of the bay, is bold and rocky, and rises 400 feet above the sea. The shoals commence about $1\frac{1}{2}$ miles northward of Black point, and at Indian point on the eastern side of Little river, about $\frac{1}{2}$ mile farther northward, they extend westward nearly $1\frac{3}{4}$ miles, sheltering the anchorage from southeasterly winds.

The settlements on the western side of the bay are mostly of French Canadians and Acadians, and they extend alongshore all the way from Tracadigash point to the river. Inland of the settlements, from 2 to 3 miles, lies Carleton mountain range.

Duthie point, the eastern entrance point of Cascapediac river, bears 309° , $4\frac{1}{2}$ miles from Black point. One mile eastward of Duthie point, and in the bay between it and Little river, stand Richmond village and church.

Light.—A square white lighthouse, with sloping sides, 33 feet high, on the southwestern end of Duthie point, exhibits, at 50 feet above high water, a fixed white light, which should be seen, in clear weather, from all points of approach by water, a distance of 12 miles.

Buoys.—A black buoy is moored in 3 fathoms water 212° , $1\frac{1}{4}$ miles from Duthie point; and a similar buoy is moored apparently on the end of the spit running off Indian point.

Anchorage.—Timber vessels moor in 3 fathoms off Richmond village, with Duthie point bearing 336° , distant $\frac{3}{4}$ mile, and the church 32° . There is also anchorage farther out in the bay in 4 to 6 fathoms, with the church on the same line of bearing, or to the westward of it, but this anchorage is not so well sheltered from easterly winds.

Directions.—From the eastward, keep Red point well open southward of Black point to clear the shoal off Indian point, and do not close the shoal to a depth of less than 4 fathoms until Richmond church bears 32° . Steer in with the church on this bearing until at the anchorage.

Red point lies 108° , $8\frac{3}{4}$ miles from Black point, and at $3\frac{3}{4}$ miles from Black point the small river Caplin flows into the sea. A reef lies off the mouth of this river $\frac{1}{2}$ mile from the shore.

Bonaventure point, $7\frac{1}{4}$ miles southeastward of Red point, is a low red sandstone cliff, with a thin superstratum of sand and clay containing tertiary shells. Bonaventure river, with 2 feet over its bar at low water, flows into the bay about $5\frac{1}{2}$ miles from Red point; and Bonaventure village with a church having a tall spire and a red roof lies on the northern side of its entrance.

Shoal.—A rocky shoal runs southeastward round the bay from Red point to Bonaventure point, from which point it extends westward about $1\frac{1}{4}$ miles.

Light.—A square white lighthouse, with a red lantern, 34 feet high, on Bonaventure point, exhibits, at 52 feet above high water, a fixed white light, which should be seen, in all directions seaward, in clear weather, a distance of 12 miles.

Anchorage.—There is good anchorage under Bonaventure point in easterly winds, in 6 fathoms, mud bottom, with Souris lighthouse bearing 103° , Bonaventure church 27° , and the river entrance 61° , $1\frac{1}{4}$ miles.

Carlisle point, about east, $4\frac{3}{4}$ miles from Bonaventure point, is sand and wooded. Shoal water extends from 600 to 1,400 yards off the coast between Bonaventure and Carlisle points.

New Carlisle, the shire town of Bonaventure county, with a jail and court house, stands on the ridge in rear of Carlisle point.

Pier.—A pier, 676 feet long, with a depth of 16 feet at its outer end at low water, extends off the shore about 1,200 yards northeastward of Carlisle point. There is a freight shed on the outer end of the pier.

Light.—A mast, 25 feet high, standing against the freight shed at the outer end of New Carlisle pier, exhibits, at 32 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 2 miles.

Paspebiac bay lies between Carlisle point and Paspebiac point, bearing 78° from the former. Paspebiac, on the northeastern shore of the bay, has an excellent roadstead, and is the principal fishing establishment in Chaleur bay. Paspebiac point is the end of a sand and shingle beach, triangular in shape, inclosing a lagoon and extending 1 mile from the mainland. On its western side are the extensive white buildings of the establishment of Messrs. Robin & Co., also the prominent store with red windows of M. le Boutellier, which is the northern building on the point, standing somewhat aloof to the westward, together with numerous huts belonging to the fishermen. On the western side of the sandy point, and close to the cliffs, the lagoon has an outlet, which has a rough bridge across it and admits boats at high water. In rear of this the mainland rises gently from the edge of dark red sandstone cliffs, displaying fields of the richest green, and buildings which extend nearly from Carlisle. There are two small churches at Paspebiac.

Light.—A square white lighthouse, 54 feet high, with a dwelling near, at 110 yards northward of the end of Paspebiac point, exhibits, at 50 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 12 miles. The light shows red over the anchorage between the bearings of 89° and 135° .

Fog signal.—A hand horn answers vessels' signals.

Paspebiac sand spit, on which the general depth is $1\frac{1}{2}$ to $2\frac{3}{4}$ fathoms, extends nearly 1 mile southwestward from Paspebiac point to the depth of 5 fathoms. It is said to have extended since the survey of 1839.

Buoy.—A red buoy is moored at the western side of Paspebiac spit, in about 3 fathoms.

Anchorage.—In the roadstead between Carlisle and Paspebiac points, but much nearer the latter, vessels are sheltered from 248° , through west, north, and east, to 112° ; and, although it is completely open to southwesterly winds, which send in a very considerable swell,

yet the ground is so good that vessels ride here, moored, all through the season. The best anchorage is in 6 fathoms, clay bottom, with Robin's flagstaff, the eastern one, adjacent to the store with a green veranda, and Single Tree point (the extreme to the eastward seen over the sandy point) in line, bearing 66° , and Paspebiac point 111° .

Directions.—From the eastward, when within 2 miles of Paspebiac point, keep the summit of Daniel hill open southward of Nouvelle point, bearing 49° until the Roman Catholic church (the eastern church) is well open westward of Paspebiac point 0° . Then steer about 277° for Carlisle point, keeping the lead going till le Boutellier's store is in line with the Roman Catholic church; now steer in for the anchorage, not opening the church eastward of the store until Single Tree point (the extreme to the eastward) is well shut in behind the sandy point, when the vessel is within the spit, and may anchor by the lead, or by a bearing of the lighthouse, at or near the position given above.

From the westward, when off Carlisle point make a straight course for the anchorage; but in standing out from it with a westerly wind, and especially with an east-going stream, attend to the marks for clearing the spit to the westward. The Roman Catholic church must not be opened eastward of le Boutellier's store until Single Tree point is well open southward of Paspebiac point, nor should the vessel bear up to the eastward of 156° until Daniel hill opens southward of Nouvelle point.

Wharf.—There is a wharf 450 feet in length at Paspebiac (1905).

Storm signals are exhibited at Paspebiac.

Supplies of all kinds, but to a limited extent, may be obtained at Paspebiac, and there is an excellent watering place at a stream which falls from the cliffs just westward of the outlet of the lagoon.

Railway.—The terminus of the Atlantic and Lake Superior Railway is at Paspebiac; the railway runs to Matapedia, where it connects with the Canadian Pacific railway.

The United States is represented at Paspebiac by a consular agent.

Nouvelle point, 56° nearly 5 miles from Paspebiac point, is a cliff of red sandstone, 100 feet in height. Nouvelle river, which flows into the sea on the eastern side of Nouvelle point, has a depth of 2 feet over its bar at low water. On the sandy beach at its eastern entrance point there are fish stores and stages.

The coast from Nouvelle river trends northeastward $9\frac{1}{4}$ miles to West point, which is craggy gray limestone, with a high semi-isolated rock at its southeastern extreme.

Daniel hill, about 1 mile westward of West point, and the highest land close to the sea on this coast, rises 400 feet above the sea.

Port Daniel, the entrance of which lies between West point and Pillar point, $1\frac{1}{2}$ miles to the northeastward, is a fine bay, open to the eastward, and about $1\frac{1}{2}$ miles deep. In the northern corner of the bay $\frac{1}{2}$ mile within White point, locally known as cap à l'Enfer, which lies about 274° , 1,200 yards from Pillar point, and is high and of white limestone, a small river enters the bay through a sandy beach, after descending a beautiful valley between wooded hills. There are many houses and stores near the entrance of this river, which admits boats only at high water, and is nearly dry at low water.

A shoal extends $\frac{1}{2}$ mile from the shore all around the port from West point to White point. On the northern side of West point there is a small cove, and good landing for boats.

Anchorage.—The best anchorage in Port Daniel is in 6 to 7 fathoms, mud or clay bottom, between White and West points, with the river entrance bearing 332° , and Reddish point and the southern part of Maquereau point in line 74° . This position is sheltered from east-northeast, through north and west, to south, and with winds from between these directions, the anchorage is safe. Strong south-easterly winds send in a heavy swell, but there is no difficulty in getting out at their commencement, for the points are bold, and West point may be passed at the distance of 400 yards. The ground is not good outside the line joining Pillar and West points.

Wharf.—A wharf, 525 feet long, with a depth of 13 feet water at its outer end, extends in a 191° direction from the northwestern part of White point.

Lights.—A white octagonal lighthouse, 33 feet high, situated 75 yards from the eastern extremity of West point, exhibits, at 100 feet above high water, a fixed white light that should be seen in clear weather, from all points of approach, a distance of 15 miles.

A square white lighthouse, 29 feet high, on the outer end of the wharf at White point, exhibits, at 31 feet above high water, a fixed red light, which should be seen in clear weather, from all directions seawards where not obscured by land, a distance of 11 miles.

Fog signal.—A hand horn answers vessels' signals.

Supplies of wood and water may be obtained at Port Daniel, but fresh provisions are not plentiful.

The coast from Pillar point, close off which is a remarkable rock, trends eastward, nearly 3 miles to Reddish point, which is reddish limestone, and often appears like an island close to the shore; it thence continues east-northeastward, nearly 4 miles to Maquereau point.

Light.—At Anse aux Gascons, nearly 1 mile eastward of Reddish point, there is a wharf, on the outer end of which a lantern on a pole

exhibits, at 29 feet above high water, a fixed red light that should be visible in clear weather, from all points of approach, a distance of 7 miles.

Maquereau point, which is wooded, is bold and composed of dark colored craggy rocks rising about 200 feet above the sea.

Light.—A white octagonal lighthouse, 51 feet high, with a red circular lantern, and having a white dwelling near, on Maquereau point, exhibits at 62 feet above high water, a flashing white light, showing groups of 3 bright flashes, with intervals of $2\frac{1}{2}$ seconds between the flashes, each group being followed by an eclipse of 10 seconds. The light should be seen in clear weather, from all points of approach, a distance of 13 miles

Fog signal.—A hand fog horn answers vessels' signals.

Signal station.—There is a signal and telegraph station at Maquereau point.

Tides.—It is high water, full and change, at Maquereau point at 2h. 0m.; springs rise 5 feet, neaps 3 feet.

Newport, situated north-northeastward, $5\frac{1}{2}$ miles from Maquereau point, is a fishing place, where one or two small vessels moor within a shoal to take in fish during summer, but even then there is some risk.

Light.—A square white lighthouse, 27 feet high, on an island off Newport point, nearly 1 mile east of Newport, exhibits, at 36 feet above high water, a fixed white light, which should be seen in clear weather a distance of 11 miles.

Fog signal.—A hand horn answers vessels' signals.

Great Pabou, a fishing place about 3 miles north-northeastward of Newport, and of considerable extent, is suitable only for very small craft; it had 4 feet over its bar at low water in 1839, but the depth and situation of the narrow channel change with easterly gales.

Little Pabou, northeastward, 5 miles from Great Pabou, is a similar but much smaller place, with a foot of water over its bar at low water.

Storm signals are displayed at St. Adelaide de Pabou.

Grand river, nearly 4 miles east-northeastward of Little Pabou, is a considerable stream, but has only 2 feet over its bar at low water. There is a village and a considerable fishing establishment at its mouth, immediately westward of which a shoal extends fully $\frac{1}{2}$ mile offshore.

Light.—A white hexagonal lighthouse, with a red lantern, 43 feet high, on the eastern side of Grand river entrance, exhibits at 52 feet

above high water, a fixed red light, which should be seen in clear weather, seaward and up the river, a distance of 8 miles.

Fog signal.—A hand horn answers vessels' signals.

The coast from Grand river trends eastward $6\frac{1}{2}$ miles to cape Espoir, and has no detached dangers except some rocks close inshore, and about 1 mile to the westward of cape Espoir.

Cape Espoir (d'Espoir), the northeastern point of Chaleur bay (baie de Chaleur), consists of red sandstone cliffs, without beach, and is of a moderate height.

Light.—A white square wooden building, 43 feet high, near the extremity of the cape, exhibits, at 90 feet above high water, a revolving white light, which attains its greatest brilliancy every $\frac{1}{2}$ minute, and should be seen, in clear weather, a distance of 15 miles.

A white dwelling with a red roof is attached to the lighthouse.

Fog signal.—A hand fog horn answers vessels' signals.

Marine signal station.—There is a telegraph and signal station at this lighthouse.

Leander shoal, lying southeastward 1.6 miles from cape Espoir, is about $\frac{1}{4}$ mile across, within depths of 4 fathoms, and it has a least depth of 16 feet, which, however, it is very difficult to find. The shoal is rocky, and there is a clear passage between it and the cape.

Clearing marks.—White head, extreme in line with the north-western end of Percé rock, leads just outside of the shoal in 7 fathoms; therefore the whole of Percé rock, well open eastward of White head, leads clear outside of all. From a half to the whole of the Percé rock shut in behind White head leads clear between the shoal and cape Espoir.

Cock cove.—There is a basin at Cock cove, the first beach northward of cape Espoir, with two training piers, each 440 feet long.

Buoy.—A red can buoy is moored in 4 fathoms water in the middle of Cock cove, to indicate the limit of fishing nets; vessels anchor outside the buoy.

Beau-fils bay lies between cape Espoir and White head, which bears 39° from the former. The bay is simply an indentation of the coast about $1\frac{1}{2}$ miles deep. The 3-fathom line of soundings is $\frac{1}{4}$ mile from the shore, and beyond that line the soundings are 4 to 22 fathoms. About $3\frac{3}{4}$ miles northeastward of cape Espoir red sandstone cliffs begin, and they continue to within 1 mile of White head.

Storm signals are shown at anse au Beau-fils, which is about half way between cape Espoir and White head.

Bonaventure island, situated directly eastward of White head, is 400 feet high, and has bold and perpendicular cliffs of red sandstone and conglomerate on all sides except the western. These cliffs, in

places, attain a height of 250 feet above the sea, and their ledges and fissures are the habitation of innumerable gannets. Shoal water extends $\frac{1}{4}$ mile from the western side, and there is anchorage in 15 fathoms between it and White head, but the riding is insecure and heavy in consequence of the swell, which, in bad weather, rolls round the island. The channel between Bonaventure island and Percé rock is about 1.3 miles wide, and clear.

Light.—A square white building, 29 feet high, on White head, the southwestern extreme of Percé bay, exhibits, at 149 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 13 miles.

Fog signal.—A hand fog horn answers signals from vessels.

Percé rock, 288 feet high, precipitous all round and bold to seaward, is narrow, about 500 yards long, west-northwest and east-southeast, and has a large hole perforated through it by the waves, through which a boat can pass at high water. A reef connects Percé rock with Percé point, and small vessels anchor off the northeastern side of the latter with westerly winds.

Percé bay lies between White head and Percé rock. Percé reef extends 800 yards off the shore $\frac{1}{2}$ mile southwestward of Percé rock. Small vessels engaged in the fisheries anchor on either side of this reef with winds off the land, but it is dangerous, and not recommended for large vessels. The shore from White head to Percé rock is locally known as South beach, and the first small bay northwestward of Percé rock is known as North beach.

Buoys.—A black can buoy is moored in 17 fathoms off South beach, with White head bearing 222° , distant 1,800 yards.

A red can buoy is moored in 17 fathoms off North beach, with the northwestern end of Percé rock bearing 160° , distant 600 yards, and a rock with less than 6 feet water over it lies nearly 200 yards southward of this buoy. These buoys mark the outside limits of fishing nets, and vessels should not go nor anchor inside of them.

Piers.—There is a landing pier in the southern cove and one in the northern cove, the latter being 670 feet long, with a depth of 13 feet at its outer end at low water.

Percé town, with a church and a population in 1901 of 1,868, principally engaged in the fisheries, occupies the shores of the bay, and the remarkable Percé mountain, or, as it is sometimes named, *la Table Roulante*, rises immediately from the town to the height of 1,230 feet above the sea, and can be seen a distance of 40 miles from sea.

A conspicuous monument stands on the bluff immediately above the town and about 800 yards northward of the church.

Storm signals are exhibited at Percé.

Communication.—The steamer of the Quebec Steamship company, running fortnightly between Montreal and Pictou, calls at Percé.

Tidal streams.—Regular streams of flood and ebb, with a rate of about 1 knot, generally run between Bonaventure island and the mainland; the flood stream setting southwestward round cape Espoir and up Chaleur bay, and the ebb in the contrary direction. From 2 to 3 miles to the eastward of Bonaventure island the current often runs southward out of the St. Lawrence.

Mal bay, between Percé rock and point Verte, is $5\frac{1}{2}$ miles wide, 4 miles deep, and entirely open to the eastward. On its southwestern side, under Percé mountain, there are cliffs rising 666 feet perpendicularly from the sea, and on its northeastern side are low cliffs of sandstone, with occasional beaches. A fine broad sandy beach, inclosing a shallow lagoon, extends across the head of the bay. A considerable river and several small streams discharge their waters into the lagoon, which has an outlet in the northwestern corner of the bay, named Tickle inlet, admitting boats at high water and in fine weather. There is anchorage all around Mal bay, but as a heavy sea and thick fog often precede a southeasterly gale and render it difficult for a vessel to beat out, it can not be recommended. An open cove or small bay is formed on the northeastern side, in which a vessel can be occasionally moored close to the shore, and in 3 fathoms water, but it is of no use for the general purposes of navigation.

Light.—A lantern on a white pole, 38 feet high, with a white wooden shed having a red roof at its base, situated on the northeastern side of Tickle inlet entrance (Barachois de Mal baie), exhibits, at 70 feet above high water, a fixed red light, which should be seen, in clear weather, a distance of 4 miles.

Storm signals are displayed at Barachois de Mal baie.

American bank, on which a depth of $7\frac{1}{4}$ fathoms has been found, is reported by the local fishermen to have a least depth of 5 fathoms; this bank is situated with Cape Gaspé lighthouse, bearing 309° , distant 11 miles.

Point Peter, the southern entrance point of Gaspé bay, is of low sandstone, and thickly covered with the white houses of the fishermen.

Pier.—In order to afford shelter for fishing boats during easterly winds, and provide berths for schooners, a pier 420 feet long, with a depth of 15 feet at its outer end, is constructed at the point.

Flat island, generally known as Plateau, lying about 800 yards off the point, is small, low, and of sandstone. There is a clear channel between the island and the point, but no good anchorage; although vessels occasionally anchor northward of the island, yet the ground is so foul and rocky that there is great danger of losing the anchor.

Light.—A square white lighthouse, 50 feet high, on the summit of Flat island, exhibits at 77 feet above high water a revolving red light that attains its greatest brilliancy every 30 seconds and should be seen in clear weather a distance of 10 miles.

A dwelling is attached to the lighthouse.

Fog signal.—A hand fog horn answers signals from vessels.

Gaspé bay.—Cape Gaspé bears 357° distant $7\frac{1}{4}$ miles from Flat island, the entrance of Gaspé bay lying between. The bay extends northwestward about 17 miles; it contains an excellent outer roadstead off Douglstown, a harbor at its head capable of holding a numerous fleet in safety, and a basin where large ships could be refitted.

Current—Caution.—The current down the St. Lawrence runs strongly past cape Gaspé over toward Flat island, especially during the ebb stream, when its rate often reaches 2 knots; it must be guarded against, especially by vessels making Gaspé bay with a northerly wind. This current, when meeting the swell which prevails from the southward and southeastward, causes a high, short, and breaking sea along the coast from above cape Rosier to cape Gaspé and extending across the entrance of Gaspé bay. With light winds a sailing vessel becomes unmanageable in this sea, and if caught in it, when near the land by a light onshore breeze, she will be in great danger.

The soundings off this coast are of great use to vessels running up in foggy weather.

Rocky patches.—Nearly in the prolongation of the line of cape Gaspé there are several rocky patches frequented by the fishermen.

A small patch with 8 fathoms least water lies 135° , 1 mile from cape Gaspé, and a patch with 16 fathoms at 130° , 1.7 miles. There are deep water and irregular soundings between them.

Winds.—In fine summer weather a sea breeze often blows right up Gaspé bay from about 9 a. m. until sunset, and generally a light land breeze blows at night down the arms, and may extend for several miles into the bay. In the outer part of the bay, in summer at night, it is generally calm, even when a fresh breeze is blowing outside cape Gaspé and point Peter, which breeze on such occasions is generally from the southwestward.

Communication.—A steamer of the Gaspé Steamship line leaves Montreal and Quebec fortnightly and calls at Douglstown, Gaspé basin, and Grand Grève, and a steamer of the Quebec Steamship company leaves Montreal and Quebec fortnightly and calls at Gaspé. A steamer of the North American Transportation company sails from Dalhousie, after the arrival of the express trains from the east and west, twice a week for Gaspé and the intermediate ports in Chaleur bay.

The southwestern shore of Gaspé bay from point Peter to Douglastown, a distance of 12 miles, presents a succession of precipitous headlands, the cliffs of bituminous shale and sandstone rising to the height of 200 feet above the sea.

In the outer parts of the bay the water is 30 to upward of 60 fathoms deep over mud bottom, but on approaching Douglastown the depth decreases regularly to the anchorage. Shoals extend from about 400 to 800 yards from the southwestern shore of the bay, and caution is necessary in approaching them as they are too steep for the lead to afford much warning.

Bois Brûlé is a small fishing cove about $6\frac{1}{2}$ miles northwestward of point Peter. There is landing for the boats on a beach, which is protected by a training pier.

Douglastown, with a population of 1,098 in 1901, is a village of fishermen and farmers, standing on the rising ground at the south side of the entrance of river St. John.

Cape Haldimand, 2 miles northward of Douglastown, is a bluff, cliffy point, and the eastern termination of the range of hills which separates the harbor, basin, and Southwest arm, from the valley of river St. John.

St. John river in spring often has a depth of 9 feet in its entrance, which is between two points of sand extending from cape Haldimand on the north and Douglastown on the south; and the river has 12 feet in the narrow channel for some distance within. At the islands, 2 miles within the entrance, the river becomes shallow and rapid, and good water can be obtained.

Anchorage.—The roadstead off Douglastown is extensive, with anchorage in any part, in depths of 11 to 6 fathoms, sand and clay; but the best berth is in 7 fathoms, with the entrance of river St. John bearing 273° , $1\frac{1}{4}$ miles. There is no shelter from southeasterly winds, which blow directly into the bay, and send in a heavy swell; nevertheless, as the bottom is excellent holding ground, the anchorage may be used during summer.

Cape Gaspé is a limestone headland, having on its eastern side a range of cliffs which rises from the sea to the height of 692 feet. The limestone of cape Gaspé dips to the southwestward, and the cliffs on its western side, or within the bay, are much lower than those on its eastern side.

Flowerpot rock, awash at high water, and decreasing in size from the action of the sea, lies close off the southeastern extremity of the cape. It is sometimes named the "Ship's Head," at others, the "Old Woman," by the fishermen. Vessels may round it into Gaspé bay, at the distance of $\frac{1}{4}$ mile, and boats pass between it and the cape when there is no surf.

Light.—A square white tower, with a red iron lantern, which rises from the southern side of the dwelling, the whole being 46 feet high, on the edge of the cliffs forming the southern extreme of cape Gaspé, exhibits, at 355 feet above high water, a group revolving white light showing three flashes with intervals of 15 seconds between the times of their greatest brilliancy, the group followed by an interval of 30 seconds, during the greater part of which the light is eclipsed; the total period of the system thus occupies 1 minute. The light should be seen in clear weather a distance of 26 miles.

Fog signal.—In thick weather or during snowstorms an explosive fog signal is fired at the lighthouse every 15 minutes; if a vessel's fog signal is heard in dangerous proximity an additional fog signal is fired and repeated every 5 minutes.

The northeastern shore of Gaspé bay is thickly covered with the houses of the fishermen for a distance of 5 miles within cape Gaspé. A church, dedicated to St. Augustin, is situated $2\frac{1}{4}$ miles within the cape, and another, dedicated to St. Jean Baptiste, stands close to the shore of a cove $2\frac{1}{2}$ miles farther northward.

There is anchorage with good holding ground, but in not less than 17 fathoms, except within $\frac{1}{4}$ mile of the shore, abreast of St. George cove, Grande Grève, and Little Gaspé. The word cove is, however, inappropriately applied to any part of the shore between Grande Grève and the cape, for though there are fishing establishments there are no coves whatever. This side of the bay is bold and clear of detached shoals, with the exception of Seal rock.

Grande Grève.—At Grande Grève, $3\frac{1}{4}$ miles within cape Gaspé, the ridge of land dips and narrows, so that there is a portage across it, leading to the settlements at cape Rosier. On the northwestern side of the portage a range of mountains commences, and continues along the northeastern side of Gaspé bay and Northwest arm to the interior of the country. A part of the range opposite to Gaspé basin rises to the height of 1,505 feet above the sea.

Seal rock lies 101° , 1,600 yards from cape Brûlé, and $\frac{1}{2}$ mile offshore. The length of this reef, between depths of 3 fathoms, and parallel to the shore, is $\frac{1}{2}$ mile; and its breadth $\frac{1}{4}$ mile. The least water on it is 4 feet, and there is a depth of $3\frac{1}{2}$ fathoms between it and the shore. Cape James, the next cliffy point up the bay, open of cape Brûlé, to an angle of 3° , leads westward of the rock.

Gaspé harbor.—From the northeastern side of cape Haldimand Sandy beach extends northward, and forms Gaspé harbor. This beach is a low and narrow tongue of sand, convex to seaward, on which side the water deepens gradually from high-water mark to the depth of 3 fathoms, a distance of nearly $\frac{1}{2}$ mile; on the inside it is steep-to, and forms a natural breakwater. Within this tongue of

sand is Gaspé harbor, about $4\frac{1}{2}$ miles long, west-northwest and east-southeast, and completely sheltered, with a general width of 1 mile and depths of 4 to 11 fathoms, mud bottom.

Northwest and Southwest arms are extensions of the harbor in the directions indicated by the names.

Light.—A white lighthouse, with a red roof, 34 feet high, erected in a depth of 6 feet at the northern end of the spit extending from Sandy Beach point, exhibits, at 32 feet above high water, an intermittent white light thus: Light, 6 seconds; eclipse, 4 seconds, which should be seen in clear weather a distance of 10 miles.

Fog signal.—A hand bell answers vessels' signals.

The Peninsula, on the northeastern shore, nearly 1 mile northward of Sandy Beach point, is a low sand bar, covered with spruce trees.

The narrowest part of the entrance to the harbor, between the shoal water in the bay eastward of the peninsula and that which extends from Sandy Beach point, is 850 yards wide between depths of 3 fathoms, and has a depth of 11 fathoms in the middle.

Directions.—Approach with Sandy Beach Spit lighthouse bearing about 307° until about 2 miles from it, when keep about 324° until the lighthouse bears 290° ; then steer to pass about 400 yards northward of the lighthouse, and into the harbor.

The water deepens immediately outside the depth of 3 fathoms eastward of Sandy beach, and also off the point, so that it is difficult and dangerous to beat in or out of the harbor at night, the lead giving little warning.

Ice.—The harbor is usually frozen over about December 10, but the entrance not until December 25; the ice clears about May 10, the harbor being completely closed between the last two dates. The last vessel leaves about December 6, and the first arrives from sea about May 11.

Northwest arm is a continuation of the harbor to the northwestward, and has as much water as 5 fathoms for nearly 3 miles above the Peninsula; it is navigable for boats to where Dartmouth river enters the arm between Marsh and Meadow islands, about 6 miles above the Peninsula.

Southwest arm.—The entrance of Southwest arm, about northwest 2 miles from Sandy Beach Spit lighthouse, is about 360 yards wide, between two sandy points; but the navigable channel is contracted by shoals on either side to about 120 yards, and has 27 feet of water in mid-channel.

Gaspé basin.—The deep water part of Southwest arm, which continues for $\frac{3}{4}$ mile within the entrance, is named Gaspé basin; it has a

depth of from 5 to 9 fathoms, mud bottom, and is sufficiently capacious to hold a number of vessels.

Boats can ascend Southwest arm by a narrow channel, between shoals, for about 3 miles, when the navigation, for all but canoes or flat-bottom boats, is terminated by shallow channels. Above this the river becomes contracted and rapid, and the water fresh.

Gaspé village.—A small rivulet in the bay, on the inside of the southern entrance point of Gaspé basin, is the most convenient watering place in the harbor. Around and near this rivulet is situated Gaspé village with a population, in 1901, of 454. The village has a telegraph office. Most of the inhabitants, as well as those of Northwest arm and the harbor generally, are farmers; but the people of the bay outside carry on the cod fishery. The great majority of the fishermen are either from Jersey, or descended from the people of that island, whose language they retain.

Light.—A white square lighthouse, with a red roof, 37 feet high, at O'Hara Point wharf, on the northern side of the basin, exhibits, at 38 feet above high water, a fixed red light, which should be seen in clear weather a distance of 7 miles.

Buoys.—A black buoy is moored at the northern end of the spit extending from McConnell point, the southern entrance point of the basin.

A red buoy is moored at the southern end of the shoal extending off Arnold bluff.

Tides.—It is high water, full and change, in Gaspé basin, at 2h. 40m.; springs rise 5 feet, neaps 3 feet; extraordinary springs rise 7 feet. The flood and ebb tidal streams in the entrances of the harbor and basin are regular but weak. In the bay the streams are variable, but usually almost imperceptible, and weak even near the shores.

Storm signals are exhibited at Gaspé. Owing to O'Hara Point light being red, the red storm lantern is not used at Gaspé.

CHAPTER VII.

PROVINCE OF QUEBEC—ST. LAWRENCE LOWER RIVER AND ESTUARY, SOUTH SHORE—CAPE GASPÉ TO GREEN ISLAND.

VARIATION IN 1908.

Cape Rosier	25° 30' W.	Cape Chat	24° 30' W.
Father point	22° 25' W.	Green island	21° 20' W.

The south shore of the estuary of the St. Lawrence, between cape Gaspé and cape Chat, a distance of 117 miles, is free from danger—with the exception of Serpent reef—and destitute of harbors. The mountains everywhere approach the coast, which is steep and rocky, displaying cliffs, often very high, and without beach. After heavy rains, waterfalls, which are not seen at other times, descend from great heights; small bays, with sandy beaches and rapid streams at their head, occur occasionally; yet these features are not generally so marked as to enable a stranger to distinguish one part of this shore from another with facility. Most of the bays are, however, marked by the houses of the fishermen or settlers, by bearings of which a ship's position may generally be obtained.

Caution.—The shore between cape Gaspé and cape Chat, although so free from offlying shoals, nevertheless must be guarded against in dark foggy nights, since the water everywhere along it is too deep to afford sufficient warning by the lead for the safety of vessels. The land along its whole extent, excepting in some of the bays, is of highly inclined slate and graywacke rocks, which would quickly cut through a vessel's bottom on her going ashore; and the nature of the country is such that those who might succeed in landing would run a great risk of perishing from want before they could reach a settlement.

Communication.—Steamers of the Gaspé Steamship line running between Gaspé and Montreal and Quebec fortnightly, call both going and coming at cape Rosier, l'anse à Louise, Griffin cove, Great Fox river, Little Fox river, Jaune point, anse au Vallon, Grand Étang, Point Sèche, Clorydorme point, Frigate point, Petite and Grande Vallée, cape Magdalen, Little Magdalen, St. Antoine, Mount Louis, Claude river, Martin river, Ste. Anne des Monts, cape Chat, les Mechins, Ste. Felicité, and Matane.

Cape Rosier, 349° , $6\frac{1}{2}$ miles from cape Gaspé, is low, and composed of graywacke and slate rocks. Shoal water borders the cape for about $\frac{1}{4}$ mile, and a reef extends $\frac{1}{2}$ mile from the shore, off a conspicuous church in the bay, $1\frac{3}{4}$ miles southward of the cape. There is shelter under cape Rosier from northwesterly winds, but the ground is not very good, and the easterly swell that frequently rolls in renders it a dangerous anchorage. There are fishing establishments on the cape and in its vicinity.

Light.—A circular white lighthouse, 112 feet high, on cape Rosier, exhibits, at 136 feet above high water, an intermittent white light, showing thus: Light, 15 seconds; eclipse, 5 seconds, which should be seen in clear weather a distance of 17 miles.

Fog signal.—In thick weather or during snowstorms a diaphone trumpet operated by compressed air gives 1 blast of 7 seconds duration every minute, thus: Blast, 7 seconds; silent interval, 53 seconds. If the trumpet is out of order a horn will give similar blasts.

Marine signal station.—There is a telegraph and signal station, which is included in Lloyd's system, at this lighthouse.

Griffin cove and river are $6\frac{1}{2}$ miles north-northwestward of cape Rosier. The cove is a small bay with a depth of 2 to 3 fathoms, sandy bottom, which affords shelter to the boats of the fishermen whose houses are around the cove.

Range lights.—Two white masts, with diamond shaped marks attached, on the shore of Griffin cove and higher ground inland, exhibit fixed red lights, visible 5 miles, which in line 244° lead about 400 yards from the northwestern point of the cove.

Supplies of water, wood, and occasionally fresh provisions may be obtained.

Great Fox river.—The shore from Griffin cove trends northwestward for nearly 5 miles to a small bay about $\frac{3}{4}$ mile wide and $\frac{1}{2}$ mile deep, with a fine sandy beach at its head, into which Great Fox river, a mere brook, flows. Off each point of the bay there are reefs, which reduce the breadth of the entrance to less than $\frac{1}{4}$ mile, and afford shelter to boats, and small craft in a depth of 2 to $2\frac{1}{2}$ fathoms, fine dark sand. At $\frac{1}{4}$ mile outside the reefs, which extend only a short distance seaward, there is a depth of 15 fathoms, sand and broken shell.

Piers.—A small landing pier was constructed in 1896. A pier intended to form a small harbor of refuge was commenced in 1901.

Buoy.—A black can buoy, No. 9, is moored in 7 fathoms water in the middle of the bay, off Great Fox river, to indicate the anchorage ground. Vessels should not go inside this buoy, as fishermen lay their nets out to that limit.

Range lights.—Two white masts, with diamond shaped marks attached, on the shore of Great Fox river entrance and higher ground inland, exhibit fixed red lights, visible 5 miles, which in line 222° lead to No. 9 buoy.

Storm signals are exhibited here.

Settlement.—Great Fox river is one of the most ancient settlements in the county of Gaspé, and is the first important fishing station and business place met with on the southern shore of the St. Lawrence above Gaspé basin. There is a large stone church at the settlement. The population is estimated at 1,700, and the principal industries are farming and fishing.

Supplies.—In fine summer weather a vessel might anchor off Great Fox river and obtain water, wood, and fresh provisions; but otherwise the bay is of no use to shipping.

Serpent reef.—Serpent point is northwestward $4\frac{1}{2}$ miles from Great Fox river, and Serpent reef, the only danger on this coast, extends eastward 1 mile from the point, the outer end of the reef with 3 fathoms water being $\frac{2}{3}$ mile offshore.

Buoy.—A black can buoy, No. 13, is moored in 6 fathoms water off the outer part of this reef, and about 1 mile from the shore. Vessels must not pass between the buoy and the land.

NOTE.—This buoy is occasionally washed away.

Fame point.—The shore of the estuary from Serpent point trends about 304° , $6\frac{1}{2}$ miles to Fame point.

Light.—A cylindrical lighthouse, 49 feet high and painted red, on Fame point, exhibits, at 190 feet above high water, a flashing white light, showing 1 group of 2 white flashes every 10 seconds, thus: flash, 0.43 second; eclipse, 1.82 seconds; flash, 0.43 second; eclipse, 7.32 seconds. The light should be visible, in clear weather, a distance of 20 miles.

NOTE.—The lighthouse is painted red in order to ascertain if this color renders it conspicuous against the summer vegetation or the spring and autumn snow.

Fog signal.—A diaphone trumpet operated by compressed air, placed in a small rectangular building, painted Indian red with white trimmings, located 50 feet southeastward of the lighthouse and 172 feet above high water, gives, during thick or foggy weather, a blast of 4 seconds' duration every minute.

Marine signal station.—There is a telegraph and signal station included in Lloyd's system at this lighthouse.

Wireless telegraph.—At Fame point there is a wireless telegraph station, the call letter of which is FP, maintained by the Canadian government.

The Great Pond (Grand Étang), nearly 5 miles west-northwestward of Fame point, is a small creek, which affords shelter only to boats and may be known by the houses and stages of the fishermen.

Telegraph and signal station.—Clorydlorme point, where there is a telegraph and signal station, is 5 miles northwestward from the Great Pond.

Range lights.—Two white masts, with diamond shaped marks attached, at Clorydlorme, just to the eastward of the point, exhibit fixed red lights, visible 5 miles, which in line 199° lead about 400 yards southeastward of the northwestern point of the bay.

Frigate point is nearly midway between Fame point and cape Magdalen, and may be recognized by numerous white cottages and a conspicuous waterfall westward of the point.

Grande Vallée, where a small stream flows into the estuary, is situated 8 miles westward of Frigate point; there is a wharf on the eastern side of the entrance, and in order to afford landing and shipping facilities and shelter to steamers, small vessels, and fishing craft, a breakwater wharf, 900 feet long, is to be built.

Range lights.—Two white masts, with diamond shaped marks attached, at Grande Vallée, exhibit fixed red lights, visible 5 miles, which in line 188° lead to the northwestern side of the bay.

Magdalen river.—The mouth of this river is on the northwestern side of a sandy bay, and close under cape Magdalen, which, jutting out a very short distance from the range of hills forming the shore, is situated 281° , 15 miles from Frigate point, and is rocky, with cliffs of moderate height. A reef of rocks, partly dry at low water, extends from cape Magdalen, about 400 yards eastward, parallel to the shore and shelters the entrance of the river from northerly winds. The river is 30 yards wide at the entrance, with a depth of 7 feet at low water, and for a short distance within has a depth of 10 feet, fine sand. Farther up the river becomes shallow and rapid, winding its way through a valley between the mountains. There is a sawmill near the mouth of the river. At spring tides 13 feet water can be carried into this river, which is occasionally visited by vessels of 30 to 80 tons; they warp in when the sea is smooth and the weather fine. The bay is not deep, being merely a gentle curve with a sandy beach extending about 1 mile southeastward of the river.

A shoal with 3 fathoms water on it lies 107° about 1,600 yards from cape Magdalen and 575 yards offshore.

Anchorage.—There is temporary open anchorage during fine weather in 7 fathoms, in sand, fine gravel, and broken shells, with the lighthouse bearing about 256° , distant 1,500 yards, and with the sandy beach the same distance; wood and water can be obtained.

Tides.—It is high water, full and change, off Magdalen river, at 1h. 15m.; springs rise 6 to 8 feet and neaps 3 to 4 feet.

A regular alternation of the tidal streams has been observed. The flood, with a rate of 1 knot, extended to about $1\frac{1}{2}$ miles from the shore, and at the line of its junction with the almost constant downward current was a strong ripple.

Light.—A hexagonal lighthouse, 54 feet high, painted white with one vertical black stripe, on cape Magdalen, exhibits, at 147 feet above high water, an alternating light showing red and white, alternately at intervals of 2 minutes. The red light should be seen, in clear weather, a distance of 15 miles and the white light 18 miles.

The keeper's dwelling is behind the lighthouse.

Fog signal.—During thick weather or in snowstorms a diaphone trumpet, operated by compressed air, placed in a white building with a red roof, on the cliff in front and westward of the lighthouse and 128 feet above high water, gives blasts of 3 seconds duration, with intervals of 27 seconds between the blasts.

Marine signal station.—There is a telegraph and signal station included in Lloyd's system at this lighthouse.

Pleureuse point.—From cape Magdalen the shore trends westward 12 miles to Pleureuse point, and thence continues westward for 11 miles to Claude river.

Rivers.—From off this shore four well-marked openings in the high land may be seen; the eastern one is Grande Matte or Pleureuse river; the next one, $3\frac{1}{2}$ miles westward, is Mount Louis river; then comes Claude river, 3 miles farther westward, and lastly Pierre river, $3\frac{1}{2}$ miles westward of Claude river.

Mount Louis river, 4 miles westward of Pleureuse point, is 20 yards wide at the entrance, and capable of admitting only small boats at low water. At high water there are 7 feet in the entrance and for a short distance within. Numerous houses and a church with a spire have been built on the beach, of shingle. that forms the south-eastern entrance point to this river.

Mount Louis bay.—The small bay, with a sandy beach at its head, into which Mount Louis river falls, is 1 mile wide and nearly $\frac{3}{4}$ mile deep. There is anchorage in it nearer the western than the eastern side during fine weather, in 8 to 16 fathoms, mud. The holding ground is excellent; but there is not much room to work out, and it would be dangerous for a sailing vessel of any size to be caught there by an onshore wind; but a landing pier is being built (1905) from the western shore toward the eastern point of the bay, which will, when completed, afford shelter from northerly winds. Small vessels, or ships requiring wood or water, may anchor for a few hours under

favorable conditions. sheltered from winds, between west and east, and through south.

Range lights—Buoy.—Two white masts, with diamond-shaped marks attached, on the shore of Mount Louis bay and higher ground inland, exhibit fixed red lights, visible 5 miles, which in line 177° lead to a buoy in the bay.

Martin river.—The shore from Pierre river trends a little southward of west, $10\frac{1}{2}$ miles to the entrance of Martin river.

Light.—An octagonal lighthouse, 63 feet high, painted bright red, at the entrance of Martin river, exhibits, at 130 feet above high water, a group-flashing white light, showing groups of 4 flashes every 30 seconds; each flash being of 0.5 second duration, with eclipses between flashes of 4.5 seconds; and the group followed by an eclipse of 14.5 seconds, which should be seen, in clear weather, a distance of 17 miles.

The keeper's dwelling is attached to the lighthouse.

Fog signal.—During thick or foggy weather a diaphone trumpet operated by compressed air, gives 1 blast of 5 seconds duration every minute. The trumpet is elevated 70 feet above high-water mark and projects in a 350° direction from the northern end of the fog-signal building, which is a rectangular, wooden building, painted red, with a high chimney, and standing 194 feet, 85° , from the lighthouse.

Marine signal station.—There is a telegraph and signal station at the lighthouse.

Cape St. Anne.—From Martin river the shore trends westward $10\frac{1}{2}$ miles to the high cape St. Anne.

St. Anne mountains.—Westward of cape St. Anne the mountains begin to recede a little from the shore, and to diminish in height. There is, however, another range of mountains called St. Anne or Shickshoc mountains, about 8 to 15 miles inland, and their highest peak, which is about 14 miles southward of cape Chat, rises 3,973 feet above the sea. These are the highest mountains in the eastern part of British North America.

St. Anne river, which is $4\frac{1}{2}$ miles west-southwestward of cape St. Anne and $10\frac{1}{4}$ miles eastward of cape Chat, can be entered by small vessels at high water through a difficult entrance. A large rock above water divides it into two very narrow channels, through which a rapid current almost always runs. The river flows into the sea through the sandy beach of a bay, which affords very indifferent anchorage, the depth of water being too great, except at a distance from the shore too little for any but small vessels.

St. Anne des Monts village, which has a church, is on the shore of the bay, and can generally furnish supplies of provisions.

Range lights.—Two white masts, with diamond-shaped marks attached, at St. Anne des Monts village exhibit fixed red lights, visible 5 miles, which in line, and also in line with the church, bear 155° .

Buoy.—A black can buoy, No. 17, is moored at St. Anne river.

St. Anne point is 2 miles westward of St. Anne river, and the shore thence trends west-southwestward $8\frac{1}{2}$ miles to cape Chat, there being one prominent point between.

Chat river, $2\frac{3}{4}$ miles eastward of cape Chat, flows between large bowlders into a small sandy bay, which affords no anchorage; but the river admits small craft with difficulty at high water. A training pier was constructed in 1899. The point, 2 miles eastward of the river, is a low spit with a reef extending $\frac{1}{2}$ mile from it. Small vessels occasionally anchor under the point in westerly winds.

Buoy.—A black can buoy, No. 19, marks les Cailles at Chat river entrance.

Cape Chat (Chatte) on easterly or westerly bearings appears as a round hill separated from, but of less height than, the land behind it.

Light.—A square lighthouse, 32 feet high, and painted white with two black vertical stripes, on the northeastern part of cape Chat, exhibits, at 120 feet above high water, a revolving white light, which attains its greatest brilliancy every $\frac{1}{2}$ minute, and should be seen in clear weather a distance of 17 miles.

Fog signal.—During fog and snowstorms an explosive fog signal is fired every 15 minutes. If a vessel's fog signal is heard in dangerous proximity an additional fog signal is fired and repeated every 5 minutes. The fog-signal derrick is on the edge of the cliff at 106 feet eastward of the lighthouse.

Marine signal station.—There is a telegraph and signal station at this lighthouse.

Tides.—It is high water, full and change, at cape Chat at 0h. 0m.; springs rise 13 feet, neaps 8 feet.

The southern shore of the estuary of the river St. Lawrence from cape Chat trends west-southwestward 34 miles to Matane; it is straight, bold, and composed of inclined slate and graywacke rocks. Although not very high, it is still of considerable elevation, and St. Anne mountains continue nearly parallel to it, at the distance of about 15 miles inland, to their southwestern termination, which is situated about 18 miles southeastward of Matane. There are several detached hills farther westward, which are also at a considerable distance from the estuary. Two of these, called the Paps of Matane,

can with difficulty be made out on southwesterly bearing, and with much greater difficulty on other bearings.

Capuchin cove, and also a cove on the western side of cape Michaux, afford shelter to boats. Cape Balance is 24 miles westward of cape Chat; at St. Félicité, $1\frac{1}{2}$ miles farther westward, is a church close to the shore. At Little Matane river, a small stream 3 miles eastward of Matane river, there are settlements.

Roix shoal, which lies with St. Félicité church bearing 184° , distant 1 mile, and nearly 1 mile offshore, is a rock about 500 feet long, east and west, and 400 feet broad, with a depth of 4 fathoms over it and 9 fathoms around. The sea seldom breaks on the rock, but there is often a heavy curl on it.

St. Félicité fog signal.—A diaphone trumpet or siren, operated by compressed air, placed in a rectangular white building 15 feet above high water, situated on the extremity of the low point projecting from the general trend of the coast at 265° , 2 miles from St. Félicité church, gives in thick or foggy weather 1 blast every minute, thus: Blast, $3\frac{1}{2}$ seconds; interval, $56\frac{1}{2}$ seconds.

Matane river, the entrance to which is 245° from cape Chat, is reported to have its source in a lake of considerable dimensions, distant about 60 miles, following the stream, inland. The depth over the bar is usually 4 feet at low water, but the height of the water seems to depend so much upon the prevailing winds that it is impossible to calculate it at any time exactly. The bar continually shifts from the effects of gales, and therefore no directions can be given.

The bar, when surveyed, extended in a circular form from the eastern entrance point, and was nearly met by a bank of sand, extending from the small isolated cliff on the western entrance point, so that only a very narrow channel was left. In the channel there are several large bowlders lying on the sand, which diminish the depth 2 feet, and are extremely dangerous when there is any swell. The bar dried at low water, and no part of it extended more than 600 yards outside the entrance of the river. Inside the bar the entrance, between two sandy points, is not more than 60 yards wide, and it has a rapid current during the ebb tide. There is not room enough for a vessel to lie safely afloat inside, but coasting craft ground at half tide on a good bottom of mud and stones. The sandy beach extends about $\frac{1}{3}$ mile eastward of the entrance, and incloses a large space dry at low water, with the exception of the narrow and rapid channel of the river, which is full of stones. The tide ascends about 1 mile to a rapid over a ledge of rocks, above which the stream is swift, shallow, and navigable only for canoes to the lake in which the river has its source. Landing in a boat at this river in bad weather is very dangerous at low water in consequence of the heavy surf on the sand banks at its entrance.

Lights.—A cylindrical lighthouse, 67 feet high, painted bright red, at the entrance of Matane river, exhibits, at 85 feet above high water, a group-flashing white light, showing 1 group of 2 flashes every $7\frac{1}{2}$ seconds, thus: Flash $\frac{1}{2}$ second, eclipse 1 second, flash $\frac{1}{2}$ second, eclipse $5\frac{1}{2}$ seconds, which should be seen, in clear weather, a distance of 15 miles.

A mast, 20 feet high, with a white shed at its base, on the end of the pier at the western entrance point of Matane river exhibits, at 30 feet above high water, a fixed white light which should be seen, in clear weather, a distance of 7 miles.

Marine signal station.—There is a telegraph and signal station at the lighthouse.

Buoys.—A black bell-buoy, No. 21, is moored in 10 fathoms on the outer edge of the shoal off the mouth of Matane river, with Matane lighthouse bearing 201° , distant 1 mile.

Three small buoys mark the entrance to the river.

Pier.—There is a pier at Matane.

Pilots reside in the village, and the entrance should not be attempted without one.

Supplies of provisions can usually be obtained at Matane.

Anchorage.—There is anchorage outside the bar in 5 fathoms at about $\frac{1}{2}$ mile offshore, and in 10 fathoms a little farther out, the bottom being sand and clay.

Tides.—It is high water, full and change, in Matane river, at 2h. 15m.; springs rise 11 feet, neaps 7 feet.

The rise of the tide is very irregular; easterly winds raise the water and westerly winds lower it.

St. Jerome de Matane, containing a large stone church, is the name of the seignory which in 1901 contained 1,176 inhabitants, most of whom live by the combined means of fishing and farming. The soil is good, and gives good crops of wheat and other grain, excepting in bad seasons. The village contains several saw and grist mills and a spool wool factory.

The shore from Matane trends about 236° , 23 miles to Little Metis bay; it is low, rocky, wooded, unbroken, and may be approached with care by the lead, the bank of soundings becoming gradually wider to the westward.

The village of Rivière Blanche, or St. Ulrich de Matane, situated about 9 miles westward of Matane, contains a church, large stores, a creamery, and sawmills. It has a wharf from which a considerable quantity of lumber is shipped.

Little Metis bay is small and divided into two rocky coves, which are open to the eastward, and dry at low water. There are several

buildings and a fishing establishment on Metis point, the outer extreme of the bay.

Little Metis river, a small stream, flows into the head of the southern cove.

A reef, which is bold on its northern side, with some of its rocks always above water, extends nearly $\frac{3}{4}$ mile eastward from Metis point, and enables small vessels to anchor midway between the eastern end of the reef and the large Round rock, which lies eastward about $1\frac{1}{2}$ miles from the reef off the outer point of the bay. At this anchorage small vessels are partly protected from winds as far northward as 292° , in a depth of 3 fathoms, mud bottom; larger vessels anchor farther out in 5 to 6 fathoms water, but not in the stream of the reef, where the ground is foul and rocky.

Round rock, bearing 113° , leads just clear of the eastern end of the reef, but in a vessel of moderate draft do not bring the rock eastward of 135° . This rock will serve to point out Little Metis to a stranger. The eastern end of the reef should not be closed to less than 4 fathoms.

Tides.—It is high water, full and change, at Little Metis bay at 2h. 10m.; springs rise 13 feet, neaps 8 feet.

Light.—A square lighthouse, 40 feet high, and painted bright red, on Metis point, exhibits, at 56 feet above high water, an alternating light showing red and white alternately every minute, which should be seen, in clear weather, a distance of 13 miles. The keeper's dwelling is attached to the lighthouse.

Marine signal station.—There is a telegraph and signal station at this lighthouse.

Metis bay is separated from Little Metis bay by Metis point. The bay is rather more than 3 miles wide and $\frac{3}{4}$ mile deep; but it is all shoal.

Anchorage.—Small vessels anchor in $3\frac{1}{2}$ or 4 fathoms, under Metis point, close to the edge of the shoal water. Although there is no shelter, vessels take in timber here all through the summer, and usually moor in 6 fathoms at low water, mud bottom, with the river entrance bearing about 180° , distant $1\frac{1}{2}$ miles. In this position vessels are $\frac{1}{2}$ mile seaward of the 3 fathoms edge of the shoal water, and being outside the line joining the points of the bay they are exposed to the prevailing alongshore winds, and must ride very heavily at times. There is, however, seldom much sea so close inshore with these winds, and northerly winds are seldom strong until the commencement of September, after which this anchorage is dangerous; at other times, with fine weather, vessels anchor anywhere off the bay in 6 to 12 fathoms, with a good bottom, and plenty of room to get under way.

Metis river, a small stream, flows into the western part of the bay about 5 miles southwestward of Metis point; it is nearly dry outside its narrow entrance at low water.

Cock cove.—The shore from the western point of Metis bay trends about 236° , 9 miles to Cock cove, which affords good anchorage for small vessels, in 3 fathoms at low water, well sheltered from along-shore winds. On Cock point, the western point of the cove, stands St. Luce church, which has a steeple.

Buoy.—A black can buoy, No. 25, is moored in 5 fathoms water at the edge of the shoal off Cock point.

Mount Camille, which is an isolated peak 2,036 feet high, bears 130° . distant $7\frac{3}{4}$ miles from Cock point.

Anchorage.—There is anchorage for vessels of any draft in fine weather, all along the shore from Metis bay to Green island.

Father point, 239° , $4\frac{3}{4}$ miles from Cock point, is low, and covered with houses.

There is a considerable village named Ste. Anne de la pointe au Père, with a fine church, situated about $\frac{1}{4}$ mile southeastward of Father point. A wharf 800 feet long, with a depth of 18 feet at low water at its outer end, has been built.

Light.—A square lighthouse, 52 feet high, and painted white, with one black horizontal band, on Father point, exhibits, at 48 feet above high water, a revolving white light, attaining its greatest brilliancy every 20 seconds, which should be seen, in clear weather, between 233° and 64° . through south, a distance of 12 miles.

Fog signal.—In thick weather or during snowstorms a diaphone siren, worked by compressed air, gives 2 blasts, each of 4 seconds' duration, every minute, thus: Blast, 4 seconds; interval, 3 seconds; blast, 4 seconds; interval, 49 seconds. The fog-signal house is a white, rectangular building on the beach at 58° , 432 feet from the lighthouse, and the siren is 17 feet above high water.

In the event of the siren being out of order, an explosive fog signal is fired every 15 minutes, and in answer to steamers' signals.

Marine signal station.—There is a telegraph and signal station at the lighthouse.

Wireless telegraph.—A wireless telegraph station whose call letter is "R. T." is maintained at Father point by the government of the Dominion of Canada.

Storm signals are exhibited at Father point.

Pilots.—The Canadian department of marine and fisheries controls the pilotage of the lower St. Lawrence between a line drawn from Father point to the eastern anchorage ground at cape Colombier, on the northern shore, as the eastern limit, and Quebec as the west-

ern limit. Pilots are embarked by inward-bound vessels and disembarked by outward-bound vessels at Father point by a steam pilot boat. Special pilots stationed at Father point are employed for the Saguenay river.

Light-buoy.—A black cylindrical light-buoy, No. 27B, moored in 7 fathoms, with Father Point lighthouse bearing 178° , distant 800 yards, exhibits an intermittent white light, and indicates the limit to which vessels can approach Father point to embark or disembark pilots.

Tides.—It is high water, full and change, at Father point at 2h. 29m.; springs rise 14 feet, neaps $8\frac{1}{2}$ feet.

Tide tables for Father point, with tidal differences and times at which the tidal streams turn in the lower St. Lawrence, are published by the marine and fisheries department of the Dominion of Canada.

Ice.—The river never freezes over at Father point. Drifting field ice usually arrives about December 9 and disappears about April 2; there is rarely any heavy ice until the end of December, and there is always a channel of water open, either on the northern or the southern side of the river, according to the prevailing wind, even a light air being sufficient to drive the ice to mid-channel. The river in winter is often clear of ice for a month at a time, and it is partly clear for about half that season. There is less ice than usual at Father point whenever the ice bridge forms at Quebec. The first vessel arrives at Father point from sea about April 24, and the last one leaves about November 28.

Communication.—A vessel of the Quebec Steamship Company plies between Montreal and Pictou, sailing every fortnight during the season, and calls at Father point. There is also a station of the Intercolonial railway.

Rimouski road.—The eastern point of Barnaby island bears 240° nearly $3\frac{1}{2}$ miles from Father point, and between them is Rimouski road, where vessels moor to take in lumber throughout the summer in 4 to 5 fathoms at low water, with excellent holding ground, and sheltered from a little southward of west, through south to east. The most sheltered berth is with the eastern point of Barnaby island bearing 259° and the pier 158° , in 4 fathoms, mud bottom. Small vessels anchor farther westward in 3 fathoms at low water, with the eastern end of the rocks off the eastern point of Barnaby island bearing 281° , distant $\frac{1}{4}$ mile. The anchorage farther off Rimouski is not good. A reef extends $\frac{1}{4}$ mile off the eastern point of Barnaby island and may be passed by the lead in 4 fathoms.

Pier.—The landing pier at Rimouski is 2,150 feet long, with a depth of $8\frac{1}{2}$ feet at its end at low water springs. The Intercolonial

railway runs along the pier to its outer end, where there is a shed, 110 feet long and 26 feet broad, with a small tower on top of it.

Light.—A white square lantern on the roof of the freight shed exhibits at 30 feet above high water a fixed white light, which should be seen in clear weather a distance of 10 miles.

Light-buoy.—A black cylindrical light-buoy, No. 29B, moored in 7 fathoms, with Father Point lighthouse bearing 73° , distant 2 miles, exhibits an intermittent white light, thus: Light, 7 seconds; eclipse, 6 seconds.

The buoy marks the position in the vicinity of which the mail steamers meet the tenders carrying the mails to or from the pier.

Rimouski, on the southern shore of the St. Lawrence, about 3 to 5 miles above and southwestward of Father point, is a village with a population of 1,804 in 1901, and is an important station of the Intercolonial railway. It contains a church, a college, and a convent. A large quantity of lumber is shipped to Europe from Rimouski.

The European mails are landed and shipped at Rimouski, special trains running with them to and from Quebec and Halifax. Both mails and passengers are transhipped by a steam tender.

Quarantine.—All inward-bound merchant vessels must communicate with the quarantine authorities at Rimouski, or, failing this, at Grosse isle, whence they may proceed, if granted pratique. Quarantine is performed at Grosse isle.

Supplies.—Only sufficient coal for the supply of the tender to the mail steamers is kept at Rimouski, but coal can be obtained by rail. Water can be obtained from Rimouski river.

Railway.—From Rimouski to Quebec the Intercolonial railway runs along the right bank of the St. Lawrence at the average distance of 1 mile inland from the villages. From Rimouski, eastward, the railway keeps about 1 to 2 miles from the right or southern bank of the river to Metis; it then turns inland and runs through the valley of Matapedia river to Campbellton, at the head of Chaleur bay.

Telegraph.—Along the line of railway there is communication with the telegraph lines, either from the stations or from the offices in the villages.

Barnaby island, composed of slate and graywacke rocks, is 3 miles long, parallel to the coast, very narrow, low, partly wooded, and inhabited. In the interior of the island there is a long pond of fresh, but not good, water.

The channel between the island and Rimouski dries at low water, but there is a depth of 7 feet through it at high water neaps, and 12 feet at high water springs; no vessel drawing more than 8 feet should, however, attempt this passage, since there are rocks and boulders here and there, and also fish stakes.

A shoal, with 3 fathoms water over it, extends northward and westward of Barnaby island, from the western part of which the shoal is distant 1,600 yards; and a reef extends more than $\frac{3}{4}$ mile southwestward of the southwestern end of the island. Between the southwestern end of the island and the mainland there is a large, high, and bare rock, which is distant from the island about $\frac{2}{3}$ mile.

Barnaby road.—Midway between the southwestern points of Barnaby island and the bare rock there is a depth of 2 fathoms at low water, muddy bottom, in Barnaby road, with good anchorage for small vessels in all but westerly winds. Rimouski church in line with the northeastern end of the rock leads over the tail of the reef off the southwestern end of Barnaby island and into this anchorage.

Old Bic harbor, $7\frac{1}{2}$ miles southwestward of Barnaby island, dries at low water, and has many rocks in it. The Bicoques, two round and high rocky islets, lie westward of its eastern point, and diminish the breadth of the entrance to $\frac{2}{3}$ mile.

Old Bic road.—Small vessels anchor midway between these rocky islets and the western point of the harbor, with that point bearing 248° , distant 600 yards, in 3 fathoms at low water, muddy bottom.

Water can be obtained from the river flowing into the southeastern corner of Old Bic harbor.

Orignal (Arignole) reef, 1 mile westward of Old Bic harbor, is formed of two rocks lying across the mouth of the shallow Orignal bay. The western rock is $\frac{1}{4}$ mile long and very narrow; its western end is always above water, and is distant only $\frac{1}{4}$ mile from the rocks on the eastern side of cape Orignal. The eastern rock is small, covered at high tides, and distant 600 yards from the other rock. There are 5 or 6 fathoms water between these rocks, which are bold to the northward, and a vessel might pass between them and the mainland by keeping close to them; but she should do this only in case of necessity.

Clearing mark.—The western of the two Bicoques islets its own breadth open eastward of the western point of the harbor leads northeastward of the eastern rock of Orignal reef.

Cape Orignal (Arignole), at the end of a peninsula between Orignal and Ha Ha bays, is 236° , distant $10\frac{1}{2}$ miles, from Barnaby island.

Ha Ha bay, on the southern side of the western projection of cape Orignal, affords excellent anchorage in easterly winds, off its entrance in 4 fathoms at low water, and farther in for small vessels in 3 fathoms; but it is seldom used, because the equally safe and more roomy anchorage under Bic island is much better.

Bic island lies northwestward nearly $2\frac{1}{4}$ miles from cape Orignal, and is about 3 miles long, southwest and northeast, and 1 mile broad.

Its shores are of slate rocks; it is about 150 feet high, thickly wooded, and uninhabited.

Beacons.—On the southwestern end of Bic island are three white beacons; the northwestern of which is in the form of a sugar loaf; the western is in the form of a cross reversed; and the northeastern beacon is diamond shaped.

Southeast reef extends about 79° nearly $1\frac{3}{4}$ miles from the southeastern point of Bic island; its outer part is formed of three rocks lying in a straight line, and always above water. The two eastern rocks are the largest, and are nearly joined together, while the western rock is detached, so as to leave a channel through the reef 300 yards wide, with a depth of 5 feet water.

No attempt should be made to pass between these rocks, or between them and Bic island, for the bottom is uneven, the tidal streams are irregular, and there is much foul ground; but with local knowledge small vessels pass on either side of the western rock, keeping close to it, if passing to the westward. Shoal water extends about 200 yards eastward of Southeast reef: the rocks above water are bold, both on their north and south sides. The inner part of the reef, extending from the southeastern point of Bic island, is covered and reaches farther southward than the direction of the rocks; to clear it keep the southern side of Bic island westward of 240° .

Northeast reef, a small patch of black rocks which shows at low water, lies 34° , 800 yards from the northeastern point of Bic island. Both Bicoques islets open eastward of Southeast reef, 136° , leads eastward of the reef.

West grounds are extensive flats of slate, partly dry at low water, which extend off the northwestern and southwestern coasts of Bic island: the outer point of these reefs, in 3 fathoms, lies 242° , nearly $\frac{3}{4}$ mile from the southwestern point of the island, and may be approached by the lead to not less than the depth of 5 fathoms, at low water. Southeast reef, open southward of Bic island, leads southward of West ground.

Two small round rocks, always above water except in very high tides, lie 400 yards north-northwestward of Bic island and bear nearly 158° from the western end of Bicquette island.

Water can be obtained from the bay between the eastern and southeastern points of Bic island, but not always in dry seasons; it can be obtained also from a stream on the western side of a small bay of the mainland, 4 miles westward of cape Orignal.

Bicquette island, lying $1\frac{3}{4}$ miles northward of the southwestern end of Bic island, is $\frac{1}{2}$ mile long, $\frac{1}{4}$ mile broad, and of moderate height, about 100 feet.

Light.—A circular white stone tower, 74 feet high, situated near the middle of Bicquette island, exhibits, at 109 feet above high water, a revolving white light, which attains its greatest brilliancy every 45 seconds, and should be seen, in clear weather, a distance of 17 miles.

Fog signal.—A steam horn, placed in a white building with a red roof situated 50 feet north-northwestward of the lighthouse, sounds blasts of 10 seconds' duration with intervals of 50 seconds during fogs and snowstorms. If the horn be disabled, a similar signal is made from a building 100 feet east-northeastward of the lighthouse.

Rocks.—Several large rocks above water extend $\frac{1}{2}$ mile eastward and southeastward of Bicquette island, narrowing the breadth of Bicquette channel, between them and Bic island, to about 800 yards. Two large rocks always above water, and a third which covers at high water, lie about 219° from the southwestern end of Bicquette island, nearly in a line, and extend 1 mile from the island.

Northwest reef, lying 248° , $1\frac{1}{4}$ miles from the western end of Bicquette island, is formed of two rocks about 300 yards long, which just cover at high water. The western end of Bic island in line with the northwestern point of Ha Ha bay (which, however, can seldom be plainly made out, in consequence of the high land behind it) leads over the reef. Cape Orignal in line with the western point of Bic island, 114° , leads southwestward of the reef. The western beacons on Bic island in line lead close westward of the reef.

Bicquette island and Northwest reef are bold to the northward, and there is deep water between the reef and the rocks southeastward of it, but this passage should not be used for navigation, except in case of necessity.

Bicquette channel, between Bic and Bicquette islands, should not be used for navigation, as there are no leading marks for running through, but in case of necessity it may be used with the assistance of the chart. The southwestern reef off Bicquette island is most in the way, and the two small round rocks on the Bic island side, 400 yards offshore, and bearing nearly 202° from the western end of Bicquette island, must be avoided.

Directions.—To clear the southwestern reef off Bicquette island, do not bring the southern extremity of the rocks off the southeastern side of Bicquette island to bear eastward of 48° ; and to clear the small round rocks off Bic island, which, however, always show, excepting in very high tides, do not bring the northern side of Bic island, near its eastern end, to bear northward of 65° . These directions are, however, insufficient without the chart, which must be used, for this is an intricate and dangerous place. The best time to run through is at low water, when all the reefs show; and in mid-channel

there are depths of $9\frac{1}{2}$ to 5 fathoms, with irregular soundings and occasional foul ground.

Anchorage.—There is excellent anchorage under either end of Bic island, within a distance of 3 miles, giving a sufficient berth to the reefs, and also between it and the main land, according to the wind; and it is better for a sailing vessel meeting an easterly wind to anchor than attempt to beat down the estuary in the long and foggy nights of the fall of the year.

Directions—Bic channel.—Steam vessels bound up or down the St. Lawrence may go through Bic channel, between Bic island and the southern shore of the river, keeping rather nearer the island and guarding against the shoal off Barnaby island. Pass northward of Alcide rock, which is marked by a black buoy (for clearing marks see p. 321) and thence shape a course to pass about midway between Red Islet lightvessel and Green island. In thick weather it is advisable to pass northward of Bicquette island, and then to steer for about midway between Red Islet lightvessel and Green island. (See also the following directions. For directions above Green island, see p. 453.)

Sailing vessels—With easterly winds.—Being northeastward of Bic island, with the first of an easterly gale, bear up before the weather becomes thick, and steer for Bic channel. Pass $\frac{1}{4}$ mile southward of Southeast reef, not approaching it, or the southern side of Bic island, to a depth of less than 7 fathoms at low water. Run westward $1\frac{1}{4}$ miles past the western end of Bic island, not approaching West grounds nearer than the depth of 6 fathoms at low water, then haul northward and anchor with the southern side of Bic island bearing 62° and the northern side 40° , in 8 fathoms at low water, muddy bottom. In a large and heavy vessel it might be better to anchor farther westward of the island.

In the position above given there is plenty of room to weigh with the first westerly wind, and run eastward through Bic channel. With a southerly wind and the ebb stream, it might perhaps be preferable to run to the northward and round Northwest reef, in which case do not go eastward into less than 8 fathoms at low water, and keep cape Orignal open westward of the western end of Bic island until northward of Northwest reef.

In proceeding up the river and having passed northward or southward of Bic island, in the latter case being clear also of Alcide rock, steer to pass about $1\frac{1}{2}$ miles southeastward of Red Islet lightvessel.

To proceed to the anchorage from northward of Bic island, run to the westward and pass about 1 mile northward of Northwest reef; when cape Orignal opens southwestward of Bic island, bearing 112° , haul to the southward, going no nearer to the reefs off Bicquette island than the depth of 8 fathoms, and anchor as before directed.

In thick weather, when the land can not be seen, it is not advisable to attempt Bic channel without local knowledge. To pass northward of Bicquette island keep in a depth of not less than 30 fathoms until far enough westward to insure being clear of Northwest reef, then haul to southward for the anchorage. In this case the distance run must be carefully attended to, due allowance made for the tidal stream, and the soundings considered, but the principal thing is to make sure of being westward of Northwest reef before hauling to the southward.

At night.—From some 5 miles off Father Point light, if the land can be seen, run in to a position with Father Point light bearing 65° distant 10 to 12 miles, observing that the light is not visible to the southward of this bearing. Thence shape a course through the middle of Bic channel, using caution and considering the soundings so as not to close the shore on either side. On reaching the western end of the channel, Bicquette light will open, and when the ship is clear of the West grounds, which will be when Bicquette light bears to the eastward of 12° , haul to the northwestward and anchor on a bearing of the light. In the position given above for anchoring, Bicquette light bears 23° , distant 3 miles.

If proceeding northward of Bic island, steer southwestward in a depth of about 30 fathoms, passing about 2 miles northward of Bicquette light. When the light bears 78° haul to the southward for the anchorage.

With westerly winds.—From the westward to anchor under Bic islands, after clearing Alcide rock (see p. 321), run along the southern sides of Bic island and Southeast reef; round the eastern end of the reef at a distance of not less than $\frac{1}{4}$ mile, and in a depth not less than 8 fathoms, and anchor with the eastern end of Southeast reef bearing 200° , distant $\frac{3}{4}$ mile, and Bicquette light bearing 253° , distant $3\frac{1}{2}$ miles, in 10 fathoms at low water, clay bottom.

Large ships may anchor farther eastward, but in the berth recommended there is plenty of room to cast to the southward and weather. Southeast reef should a sudden shift of wind occur. If, however, proceeding from the anchorage northward round Bicquette island, beware of Northeast reef, and also, particularly if the wind be light, of the indraft of the flood stream through Bicquette channel between Bic and Bicquette islands.

With northerly winds anchor anywhere in Bic channel, but the best berth is $\frac{3}{4}$ mile off a small sandy point, nearly in the middle of Bic island, in 8 to 10 fathoms at low water, mud bottom.

Tides and tidal streams.—It is high water, full and change, at Bic island at 2h. 15m.; springs rise 14 feet, neaps $8\frac{1}{2}$ feet. The duration of the flood stream is 5h. 50m., and that of the ebb 6h. 34m.

Westward of Bic island the flood, at its commencement, sets south-westward. There is but little flood stream at neaps in Bic channel, excepting close to the southern shore; at springs it runs through the channel at an average rate of $1\frac{1}{2}$ knots, being strongest near the mainland. It also runs through Bicquette channel, but the stream extends a very short distance outside Bicquette island.

Eastward of Bic island the outer part of the flood stream divides, one part running toward and through Bic channel, the other toward and through Bicquette channel; both streams run at their full rate only until half flood, then become gradually weaker, turning north-westward (the Bic channel stream passing round the western end of Bic island), and to the northward and northeastward toward the end of the tide.

This set of the latter part of the flood stream to the northward past the western end of Bic island should be considered when weighing from the western anchorage, or when approaching the island with light winds, especially at night or in thick weather.

The flood stream continues close along the mainland, passing inside, and also very close outside Razade, Basque, and Apple islands; but it nowhere extends a sufficient distance offshore to be of use to ships beating to the westward, much below Green island.

The stream of flood becomes weaker, and of less duration, westward of Bic island. Midway between Bic island and Razade islets there is slack water for about 1 hour at the end of the ebb; after which a weak flood, with a rate of $\frac{1}{4}$ knot, makes during the first quarter of that tide. This is succeeded by the eddy flood, with a rate of $1\frac{1}{2}$ to $2\frac{1}{2}$ knots at the edge of the bank of soundings, which runs eastward, or in the same direction as the ebb, during the remainder of the flood tide.

Because of the great excess of the east-going stream over the west-going, sailing vessels make little way to windward against a westerly wind on the bank of soundings between Bic island and Green island.

The ebb at its commencement sets offshore, or from the southward, at Bic island anchorages, and this is particularly remarkable at the eastern anchorage; but it lasts only for a very short time, after which the stream runs fairly between the islands, and along the shore to the eastward, for the remainder of the tide. Its rate, in westerly winds, varies from 2 knots at neaps to $2\frac{1}{2}$ knots at springs, but in easterly winds it is not so strong.

Bank of soundings.—The southern bank of soundings, both eastward and westward of Bic and Bicquette islands, is extensive, and the soundings on it are useful to vessels at night or in fogs. Vessels should therefore use the lead and be guided in great part by the chart.

There is anchorage on this bank in 10 to 12 fathoms, with good holding ground all along the southern shore from Bic island to Green island.

The shore of the mainland, trending southwestward 14 miles, between Ha Ha bay and Razade islets is high and rocky. The summit of the High land of Bic, 1,236 feet above high water, lies 196° , $2\frac{1}{2}$ miles from cape Orignal. The hills in this locality are high and narrow ridges of graywacke rocks, parallel to the shore and to each other, and decreasing gradually in height on either side of the High land of Bic. These ridges, when nearly end on, from either up or down the estuary, present so remarkable an outline that the land can be made out from great distances.

There are depths of 5 fathoms to within about 800 yards from the shore for $8\frac{1}{2}$ miles southwestward of the northwestern point of Ha Ha bay.

Alcide rock, lying 206° , nearly $3\frac{3}{4}$ miles from the western point of Bic island and 1.8 miles from the shore to the southward, is about 6 feet long, and 2 feet wide, with 4 feet on it at low water. It rises from a rocky shoal, about 200 yards long, east-southeast and west-southwest, and 100 yards wide, immediately around which are depths of 5 to 10 fathoms.

Clearing marks.—The southwestern (in the form of a reversed cross) and northeastern (in the form of a diamond) beacons on the western end of Bic island (see p. 316) in line, lead over Alcide rock; and the two white beacons on the mainland about 5 miles westward of cape Orignal—one of which is of a diamond shape and the other of a sugar loaf—in line, also lead over the rock; therefore to clear the rock keep one set of these beacons open. Mount Camille, 2,036 feet high, open northward of cape Orignal leads northward of the rock.

Buoy.—A black can buoy, No. 31 B, is moored in 9 fathoms close northward of Alcide rock, with the beacons on the southern shore in line and with the diamond shaped beacon on Bic island, just open northward of the reversed cross beacon.

Ridge.—From the mainland about $8\frac{1}{2}$ miles westward of the northwestern point of Ha Ha bay, the 4-fathom line of soundings runs west-southwestward for $2\frac{3}{4}$ miles and thence southwestward to Northeast Razade islet: within this line is a ridge of rocky ground with irregular depths and with 17 feet least water about $3\frac{1}{2}$ miles to the eastward of Northeast Razade islet. Basque island, its own breadth open northward of Northeast Razade islet, leads northward of the ridge. Small vessels may stand close inshore, but those of over 10 feet draft should not stand in farther than 7 fathoms at low and 9 fathoms at high water.

Razade islets.—Northeast Razade islet lies about 16 miles westward of cape Orignal and $1\frac{1}{2}$ miles from the mainland to the southward; Southwest Razade is $1\frac{1}{2}$ miles farther southwestward and $1\frac{1}{4}$ miles offshore. These islets are each about $\frac{1}{4}$ mile long, rocky, low, and bare of trees. There is no passage for vessels between the islets and the southern shore; shoal water extends about 1 mile northeastward of Northeast Razade, about 400 yards northward of it, and about 1,400 yards northward of Southwest Razade.

Basque island, lying southwestward 5 miles from Northeast Razade islet, is $1\frac{1}{2}$ miles long, parallel to the shore, and 400 yards wide. Its height is about 100 feet above the sea; it is rocky and partly wooded, with a house at its western end. There is no passage for ships between it and the mainland, from which it is distant 2 miles.

A sandy spit extends $\frac{1}{4}$ mile southward from near the southwestern end of the island. Close off the end of this spit there is a long and narrow hole with 4 to 5 fathoms in it at low water, in which small craft moor.

Shoal water extends $\frac{1}{2}$ mile northward of Basque island; a reef of rocks extends westward and northwestward from its western point, and on the western end of this reef, about 1,200 yards distant from the island, is a round rock which is uncovered at half tide.

Trois Pistoles is a village situated on the mainland southeastward of Basque island, containing a station of the Intercolonial railway; it is a flourishing center to which an extensive traffic converges. At the village there is a pier extending out 900 feet in a 322° direction, from the extremity of the point just eastward of the village church. The pier is 30 feet wide, with an L 100 feet long extending to the eastward at its outer end. The pier foundations are dry at low water.

Light.—A pole on the outer end of this pier exhibits, at 20 feet above high water, a fixed white light that should be seen, in clear weather, from all points of approach, a distance of 9 miles.

Apple island, $2\frac{3}{4}$ miles southwestward of Basque island and $2\frac{1}{4}$ miles from the mainland, is formed by one principal and several smaller adjoining rocks, the whole being 1 mile long, parallel to the shore, and 300 yards wide. It is some 30 to 40 feet above high water, and is without any trees. Between it and the main there is no passage for ships, but its northern side is bold-to, with a depth of 4 fathoms at the distance of 200 yards.

Green island, the northeastern point of which lies southwestward $2\frac{3}{4}$ miles from Apple island, is $6\frac{1}{4}$ miles long, northeast and southwest, and 1 mile wide. The island is of graywacke and slate rock, is about 250 feet high, and wooded. From its northeastern end a long and narrow point of rocks, always above water, extends more than $\frac{1}{2}$ mile from the trees on Green island toward Apple island; and

about half the whole distance toward Apple island is occupied by reefs of slate which dry at low water. Between these reefs and Apple island there is a channel carrying a few feet of water and affording a passage for small craft, which run in between Green island and the mainland at high water.

Shoal water.—The line of shoal water from Northeast Razade islet to Green island is continuous from each of these islands to the other, and it may be safely approached with care to 7 fathoms at low or 10 fathoms at high water.

Light.—A white polygonal tower, 56 feet high, on the northwest point of Green island, exhibits, at 60 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 13 miles.

A brown dwelling is attached to the lighthouse.

Fog signal.—An explosive fog signal is fired every 15 minutes during fog and snowstorms. If a vessel's fog signal is heard in dangerous proximity, an additional fog signal is fired and repeated every 5 minutes while the vessel's fog signal continues to be heard.

Beacons.—At 136° , about $\frac{1}{4}$ mile from the lighthouse, is a white beacon, which in line with the lighthouse leads northeastward of the tail of Red Islet reef.

Green Island reef extends northward $1\frac{1}{4}$ miles from the lighthouse to the depth of 3 fathoms; thence it trends, with a serrated outline, eastward till it joins the shoal water connecting Green island and Apple island. Its northwestern side is straight, running from the northeastern end of the reef to the coast of Green island close westward of the lighthouse, off which it extends only 400 yards. The rocks on the reef dry, at low water, nearly $\frac{3}{4}$ mile out from high-water mark.

On the northeastern side this reef may be safely approached to the depth of 7 fathoms at low water, but on the northern and western sides there is deep water close-to, and at the distance of a little more than $\frac{1}{2}$ mile on those sides there is a depth of 30 fathoms, which rapidly increases to about 40 fathoms.

Caution.—Deep as is the water northward of this reef, the only guides, in a thick fog when the lights can not be seen, are the soundings and the fog signal; yet, as the ebb stream sets upon the reef at the rate of 5 knots, command of the vessel must not be lost for the purpose of getting bottom, and therefore a sounding machine becomes invaluable.

Leading marks.—The summit of the high land southward of cape Orignal (the High land of Bic), open northward of Basque island (see chart), leads close northward of Green Island reef.

The eastern end of Great Pilgrim island in line with the southwestern extreme of Green island, 208° , also leads northwestward of the reef in 5 fathoms; but Pilgrim islands are so distant that they can be seen from the reef only in fine weather.

Anchorage.—There is excellent anchorage in westerly winds under Green Island reef, and this is the general rendezvous of vessels waiting for the flood to beat through between Green island and Red islet. But as the first of the flood sets to the southward and on the shoals, vessels must not anchor with the lighthouse bearing westward of 210° , or in less than 7 fathoms at low water. The position with the lighthouse bearing 210° and with a depth of 7 fathoms is $2\frac{1}{2}$ miles from the lighthouse, 1 mile from the eastern edge of the reef, and the same distance from the shoal water to the southward. Still more room may be obtained in 9, 10, or 11 fathoms, bottom of stiff mud in either depth.

Tides and tidal streams.—It is high water, full and change. at Green island at 2h. 45m.; springs rise 16 feet, neaps $9\frac{1}{2}$ feet.

The duration of the flood stream in the offing is 6h. 0m.; and that of the ebb 6h. 24m. At the anchorage with the light bearing 215° , distant 3 miles, the first of the flood stream appears to set southward; at 2 hours flood, southwestward; at 4 hours flood, westward; at 6 hours flood, northwestward. At first the ebb sets northward; at 2 hours ebb, northeastward; at 4 hours ebb, eastward; and at 6 hours ebb, southeastward. The water is never quite slack, the stream continuing to run, more or less, during the whole time. The rate of the ebb on one occasion was 3 knots, and that of the flood 2 knots.

NOTE.—The southern shore of the lower river and estuary has now been described to where the channel becomes narrow. The description of the northern shore of the gulf and estuary will now be taken up from Belle Isle strait and carried as far westward as Green island. Then in Chapter X and beyond the description of the river above Green island will be given.

CHAPTER VIII.

COAST OF LABRADOR—STRAIT OF BELLE ISLE—PROVINCE OF QUEBEC—GULF OF ST. LAWRENCE, NORTH SHORE— GREENLY ISLAND TO CAPE WHITTLE.

VARIATION IN 1908.

Belle Isle light-----	34° 45' W.	Outer island-----	32° 05' W.
Greenly island-----	33° 00' W.	Cape Whittle -----	30° 20' W.
Little Mekattina island---	31° 00' W.		

STRAIT OF BELLE ISLE.

General remarks.—In this chapter only so much description of the strait of Belle Isle will be given as will be necessary for the navigator to pass through it. The strait and the coast on each side of it are fully described in Hydrographic Office publication, No. 73, Newfoundland and Labrador.

Belle isle, lying directly off the Atlantic entrance to the strait of Belle Isle is about $9\frac{1}{2}$ miles long northeast and southwest, and 3 miles wide, and is composed of a range of hills, bare of trees, which rises 680 feet above the sea. These hills are principally of granite, alternating with clay and slate, and their sides form everywhere a steep coast, except at the northeastern end of the island, where two low points converge so as to form Black Joke cove, a narrow creek which shelters very small fishing vessels during the finest summer months. Shelter may also be obtained in Lark harbor, and in Valley cove, $2\frac{1}{4}$ miles southwestward of Lark island; but none of these coves are considered safe early in spring, or late in autumn, because of the heavy swell which rolls into them from the eastward.

Lark island, which is about 1,200 yards long, narrow, and 200 feet high, lies off the middle of the northern part of Belle isle. Lark harbor, between Lark island and Belle isle, is only 400 yards wide, with deep water and indifferent holding ground; it is much exposed to easterly winds, but as it has two entrances, vessels easily get to sea.

Black Joke cove, about 150 feet wide, with 12 feet water, is inside an islet joined to Belle isle at low water, and affords secure shelter to only two small vessels moored head and stern; but in heavy easterly gales, especially at high water springs, the seas break heavily over the ledge of rocks, and render the cove unsafe.

Valley cove affords fair anchorage and shelter during easterly winds; the bottom is sand, and between the line of the points the soundings are 17 fathoms, decreasing gradually to the shore.

The southern side of Belle isle affords no anchorage and has hardly a creek where a boat could find shelter.

Belle isle is frequented by English and French fishermen.

Rock.—A rock, with an estimated depth of 9 feet over it and upon which the sea has been seen to break heavily, lies with the southwestern end of Belle isle bearing 149° , distant $\frac{1}{2}$ mile; this rock is probably that reported by the Ontario, in October, 1881, to exist about 1 mile north-northwestward of the southwestern point of Belle isle.

Light—Northeastern point.—A cylindrical red lighthouse, 55 feet high, on the northeastern point of Belle isle, exhibits, at 137 feet above high water, a flashing white light every 11 seconds, thus: Flash, $\frac{1}{2}$ second; eclipse, $10\frac{1}{2}$ seconds, which should be seen in clear weather a distance of 17 miles.

Fog signal.—A diaphone trumpet, operated by compressed air, from a rectangular, red building, situated about 200 feet 45° from the lighthouse and 90 feet above high water, gives, during thick or foggy weather, 1 blast of $3\frac{1}{2}$ seconds' duration every minute, thus: Blast $3\frac{1}{2}$ seconds, silent interval $56\frac{1}{2}$ seconds.

Lights—Southern point.—A circular white tower, 59 feet high, on the summit of the southern point of Belle isle, exhibits, at 470 feet above high water, a fixed white light, which is visible from about 111° , through north to 243° , and should be seen in clear weather a distance of 28 miles.

The keeper's dwelling, painted white, is attached to the lighthouse.

A square white lighthouse with a red lantern, 31 feet high, situated below the high lighthouse, exhibits, at 137 feet above high water, a fixed white light, which should be seen in clear weather a distance of 17 miles, except where obscured by the high land of Belle isle.

In fog the high light may be obscured when the low light is visible, or vice versa.

Fog signal.—A siren, operated by compressed air, from a small white building midway between the high and low lights at the southern point of Belle isle and 250 feet above high water, gives during thick or foggy weather two blasts in succession, of a high note and a low note, respectively, every 2 minutes, thus: Low blast, $2\frac{1}{2}$ seconds; silent interval, $2\frac{1}{2}$ seconds; high blast, $2\frac{1}{2}$ seconds; silent interval, $112\frac{1}{2}$ seconds. Should the fog siren become disabled, cotton powder bombs will be exploded every 10 minutes. If a vessel's fog signal is heard in dangerous proximity, an additional bomb will be immediately exploded, and the explosions will be continued at intervals of 5 minutes until the vessel has passed the station.

Marine signal station.—A signal and telegraph and ice-report station is established at the southern point of Belle isle, at the lighthouse, and is included in Lloyd's system of reporting stations. A blue light burnt at this station indicates to a vessel firing distinguishing rockets that her signals are recognized and will be reported. Belle isle is connected by cable with Chateau bay, and thus with the Canadian telegraph system.

Wireless telegraph.—Vessels can communicate with Belle Isle signal station by wireless telegraph, and this system can be used for communicating between Belle isle and Chateau bay. The wireless station at Belle isle has the Marconi system and is operated by the Canadian department of marine and fisheries. Its call letter is BL.

Provision depot.—There is a depot of provisions for shipwrecked mariners at the low lighthouse on the southern point.

Northeast ledge, 13° , $1\frac{1}{4}$ miles from the northeastern point of Belle isle, dries at low water springs: there is deep water in the channel between the ledge and the island.

Strait of Belle Isle.—The eastern entrance of the strait of Belle Isle, between St. Peter islands and Belle isle is 13 miles wide, and that between Belle isle and cape Bauld, Newfoundland, is 14 miles wide, but the narrowest part of the strait is southward of Amour point, where it is $9\frac{1}{4}$ miles wide. The western entrance of the strait between Greenly island and Férolle point is nearly 2 miles wide: the point bearing from the island 169° . The length of the strait from the southern end of Belle isle to a position 7 miles south of Greenly island is about 73 miles.

The northern shore is composed of granite and is steep, rising to flat topped ridges and summits 1,000 to 1,300 feet high, from York point westward to cape Diable; thence to Long point, at the western entrance of the strait, it is composed of sandstone lying on granite.

Outer soundings.—The bank of soundings, on which the least water yet found is 86 fathoms, mud, lying about 28 miles eastward of the northeastern point of Belle isle, affords a valuable guide to vessels approaching the strait from the eastward in foggy weather.

Westward of this bank and between it and the bank, stretching eastward some 8 miles from Belle isle, and on which the depths are less than 100 fathoms, the depths are 101 to 208 fathoms, sand.

Tooker bank is composed of a series of small banks lying between lat. $51^{\circ} 43\frac{1}{2}'$ and $51^{\circ} 47'$ N., and long. $54^{\circ} 57\frac{1}{2}'$ and $55^{\circ} 00'$ W. The largest of these banks, within the 50-fathom line, is 1 mile long, north-northeast and south-southwest, and $\frac{1}{2}$ mile wide, with a least depth of 14 fathoms; this depth is situated 120° , $16\frac{3}{4}$ miles from Belle Isle Southeast lighthouse. Other heads of 36 to 50 fathoms lie northward and westward of this bank, and they are small and steep, being appar-

ently the summits of a very uneven ridge. Westward of these banks is a large gully, about 90 to 110 fathoms deep, from which the soundings gradually decrease to the depth of 60 fathoms and thence more suddenly toward the land.

Soundings in the strait.—The deepest water in the strait of Belle Isle is on the Labrador side, but the line of deep water is not direct nor continuous through the strait, and it is remarkable that there is very deep water within about 2 miles off the dangerous Flower ledges on the Newfoundland side. The depth of water varies between 80 and 16 fathoms, and the bottom is in some places rock, and in others sand, broken shells, coral, or gravel.

The strait, with the exception of Maudit bank and some shoals off the Newfoundland coast near its western end, is free from shoal obstructions to navigation in its fairway.

Maudit bank.—(See Hydrographic Office publication No. 73, Newfoundland and Labrador.

Fairway bank, lying 230° , about 14 miles from the southern point of Belle Isle, is 2 miles in extent north-northwest and south-southeast, and $1\frac{1}{2}$ miles east-northeast and west-southwest; the least water on the bank is 16 fathoms, but the general depth is 20 fathoms, rock bottom.

Centre bank extends southwestward nearly 20 miles from about $6\frac{1}{2}$ miles southward of the western point of Red bay; the depths on the bank are 24 to 30 fathoms.

Tidal streams and currents.—The movement of the water in Belle Isle strait is predominantly tidal. When uninfluenced by the wind the stream runs east and west for nearly equal periods, and turns regularly in accordance with the rise and fall of the tide. On the whole, the westerly, or inward flow, seems to be slightly greater than the easterly or outward flow.

It appears, as yet, impossible to predict with accuracy the direction of the streams in the strait, but under normal conditions the west-going stream begins about 4 hours before high water at Forteau bay, and the east-going stream about $2\frac{1}{2}$ hours after high water there, the streams turning in direction with the hands of a watch. The ordinary rate during the strength of the streams is 1 to 2 knots an hour, but the greatest rates observed have been of the west-going stream, $3\frac{1}{4}$ knots, and of the east-going stream $2\frac{1}{2}$ knots. The rates and directions of both streams are greatly affected by any strong winds blowing at the time or just previously.

On the Labrador side the west-going stream predominates, especially toward the eastern end of the strait and near the shore, where it is so strong at times as to prevent the fishermen from hauling their nets.

On the Newfoundland side, toward cape Norman, the reverse appears to be the case. Certainly there is more slack water on that side than on the Labrador side. The east-going stream runs round cape Norman with considerable strength, while the west-going stream is comparatively weak. The streams do not always run fairly through the strait, and with both the east-going and the west-going streams there is an indraft toward Cook and Pistolet bays.

A strong wind through the strait either way makes a drift, which causes the opposing tidal stream to slacken, and eventually overcomes it altogether. A continuous current then runs in the direction toward which the wind is blowing, but its rate increases or decreases according as the tidal stream is with or against it. This appears to take place earlier on the Labrador side of the strait than on the Newfoundland side, which is more under tidal influence.

The general Arctic current setting southward past the Atlantic mouth of the strait is influenced by the tidal inflow and outflow of the strait itself; the greater inflow toward the strait takes place on the northern side of the entrance and the greater outflow on the southern side.

The movement of icebergs is strong evidence of, at times at any rate, a preponderance of westerly flow of the body of water on the Labrador side of Belle Isle strait. During the summer of 1898 an unusually small number of icebergs were in the strait, due probably to the general persistence of westerly winds, but whenever they were in the strait they slowly and persistently pursued their course to the westward, keeping on the Labrador side. A gale from the westward might cause a slight drift back to the eastward, but as soon as it was over the westerly course was again resumed unless, by grounding, the bergs remained stationary, until, by breaking up, they were lightened sufficiently to drift again with the current.

All broken ice drifts ashore on the Labrador coast, none, it is stated, ever reaching the Newfoundland coast, and no ice was seen in 1898 on that side. One small berg was observed a few miles northeastward of cape Norman, but apparently this berg drifted to the eastward and did not enter the strait.

As far as could be seen, the icebergs entering the strait passed between Belle isle and Labrador. The movements of icebergs, so much of their volume being immersed, are necessarily due to the resultant flow of the whole body of water from the surface to the bottom. Many bergs were deep enough to ground in 55 fathoms.

Although persistent strong westerly winds frequently caused the surface current to flow continuously eastward, the few observations made on undercurrents showed that they were less affected by the prevailing winds than the surface current; it is therefore possible,

regarding the movement of the ice, that the body of the water on the Labrador side, taken as a whole, has a resultant flow westward.

The ice, as it broke up, always eventually drifted ashore on the Labrador coast; no noticeable indraft affecting navigation was, however, experienced anywhere, except westward of York point, where an indraft was frequently felt toward the land.

Toward cape Norman it was observed that there was a preponderance of easterly set; and although farther westward this was not noticeable, it is probable that on the southern side of the strait there is a slight general preponderance of easterly set, from the fact that the shore is everywhere thickly strewn with driftwood, none of which is ever seen on the northern shore, and it may be presumed that this driftwood comes from the St. Lawrence river.

The fishermen state that on several occasions bamboos have been washed up, in nearly every instance with a hole cut at the thick end, as if they had been used for fishing stakes, as in China, etc., and it is difficult to account for them.

About the end of July, 1898, a lumber vessel was reported to have been wrecked westward of Blanc Sablon, and shortly afterwards large quantities of floating timber were observed along the Newfoundland coast, and a quantity also came ashore at Green Island brook. None was seen on the Labrador side.

Icebergs. (See p. 41.)

Occasionally large pieces of icebergs drift into the anchorages on the northern shore of the strait, causing danger to the fishermen's nets, and even sometimes to vessels at anchor, so that it may be necessary to get underway. No warning is given of the proximity of ice, as a rule, by change of temperature of the sea. On one occasion, within 100 yards of a large berg, the temperature of the sea was 50° and its density 22, to windward; temperature 49° and density 15, to leeward: the normal temperature of the sea being 51° and density 23.

Fogs.—During summer dense fogs prevail all over the strait, and sometimes last for several days at a time. Thick fogs are equally prevalent with either direction of the wind; with westerly winds the fog commences to the westward and rolls gradually along the Labrador side, frequently extending only a short distance from that coast, so that by keeping over toward the Newfoundland side the fog may often be avoided. With easterly winds the fog is more general on both sides of the strait. The Newfoundland side almost invariably clears first. These fogs cling closely to the water and the shoreline, and from a vessel's masthead the summits of the Labrador hills may sometimes, though rarely, be seen over them.

During a period of 40 days in July and August, when simultaneous observations were made on both sides of the strait. fogs, mist, etc.,

occurred on 60 per cent of the days on the Labrador side, and on 40 per cent on the Newfoundland side.

Landing.—After strong easterly winds a heavy swell, lasting several days, sets through the strait and makes landing at most places on the coast of Newfoundland impossible.

Navigation.—Steamers navigate the strait from July to October, inclusive.

General directions.—From the eastward, with clear weather, make Belle isle or its lights, pass southward of the island and through the fairway of the strait.

In making the eastern entrance of the strait in thick weather great caution is necessary and soundings should be constantly obtained. The position may possibly be ascertained by the fog signals on Belle isle, cape Bauld, and cape Norman. Midway between Belle isle and cape Norman the depths assist in estimating the position, there being a gradual decrease in depth from the entrance until the bank, which extends northeastward 15 miles from Pistolet bay, is passed; this bank has depths under 30 fathoms, and beyond it the water deepens to from 30 to 50 fathoms.

In proceeding westward through the strait, if the vessel is in the middle, depths of 24 to 30 fathoms will be struck on Centre bank. Failure to strike this extensive bank indicates that the vessel has passed it on one side, but as the soundings are much alike on both sides it will be difficult to determine which. Some assistance may then be derived from the temperature of the surface water, which is generally, but not invariably, warmer on the Newfoundland side than on the Labrador side, there being sometimes a difference of as much as 20° F. On the Newfoundland side it seldom falls below 50° during the navigable season. When passing Amour point the fog whistle may be heard.

From the westward in clear weather make Greenly island, or its light, pass through the fairway of the strait and southward of Belle isle.

In thick weather observe that the soundings in the western approach are deeper on its northern than on its southern side. The position may possibly be ascertained by the fog signals at Greenly island and Amour point, after which there should not be much difficulty in getting to sea, assisted by the soundings and the fog signals at cape Norman, cape Bauld, and Belle isle.

A sailing vessel bound eastward through the strait with a southwesterly wind and appearance of fog toward night should, perhaps, stand off and on under easy sail, tacking by the deep-sea lead, till daylight, if not to the eastward of Férolle point. If beyond that point, it may be well to seek an anchorage.

In a sailing vessel with light winds or calms, during foggy weather, it is better to bring up with a stream anchor anywhere in the strait rather than to drift about with the streams, but a lookout must be kept for drifting icebergs.

Anchorage.—In thick weather it will probably be advisable to anchor in one of the bays on the northern side of the strait rather than continue under way. Black bay might afford a temporary anchorage in summer for a steamer. Red bay is a good small harbor, but it can not be entered by a large sailing vessel with easterly winds. Pinware bay is the first anchorage available when proceeding westward with easterly winds, but then there is a heavy swell in the bay. Anse à Loup is the first good anchorage for a sailing vessel with easterly winds, but it is not worth while stopping there when bound westward, as then the strait is nearly cleared. Forteau bay is a fairly good roadstead, although a heavy swell sometimes comes in, and Blanc Sablon is considered a safe anchorage in summer. (For full description of both shores of Belle Isle strait see Hydrographic Office publication No. 73, Newfoundland and Labrador.)

GULF OF ST. LAWRENCE, NORTH SHORE.

QUEBEC.

General description of the coast.—The northern shore of the gulf of St. Lawrence, or the southern coast of that part of the northeastern portion of the province of Quebec, lying between Long point and cape Whittle, the western end of Lake island, 136 miles to the westward, is broken into inlets and bays, and fringed with islands, rocks, and ledges, which frequently rise abruptly to within a few feet of the surface, from depths so great as to afford no warning by the lead. In some parts the islands and rocks are so numerous that only very small vessels can navigate among them. These vessels are aided by small beacons and cairns of stones, locally called squaupees, but which require local knowledge to distinguish them.

Generally the mainland does not rise over 500 feet above the sea, and is often very much lower, as are all the islands, excepting Great and Little Mekattina. These two high islands, the High land of Mekattina, 685 feet above the sea, and Bradore hills are all very remarkable, and serve to assist in fixing the position of vessels from some distance. Bradore hills are three contiguous round backed mountains, situated 4 to 5 miles northeastward from the head of Bradore bay; the northwestern summit is 1,264 feet above the sea, and is the highest land on this coast.

The mainland and islands are of granite rocks, with no trees excepting at the heads of the bays, where there are occasionally small spruce and birch trees. When not entirely barren the mainland

and islands are covered with moss or scrubby spruce bushes, and there are many ponds of dark bog water frequented by waterfowl and flocks of the Labrador curlew.

Navigation—Caution.—It is dangerous to approach this coast or to navigate in its vicinity at night or in fog, and even with daylight and fine weather great caution is required. Although the navigation is everywhere more or less intricate, yet there are several harbors suitable for large vessels, which may be safely entered. When within the outer reefs, or near them, a lookout for the ledges from aloft is necessary. Drifting icebergs are frequently met.

Tides and currents.—Inshore and among the islands the flood tidal stream sets weakly westward and the ebb weakly eastward; but both streams are much influenced by the winds. In the area between a line drawn from Rich point northward to Eskimo islands and the western end of Belle Isle strait, the currents are variable and uncertain, being intermediate between a current setting northeastward on the western coast of Newfoundland and the tidal streams of Belle Isle strait. In the western part of this area the rate is usually less than 1 knot, and rarely greater than $1\frac{1}{2}$ knots, but toward the entrance of the strait it increases. In the offing of Eskimo islands the stream usually sets along the land in either direction, but at times it sets off and on shore for a whole tide. A current sometimes runs southeastward from the vicinity of Greenly island and sets strongly on the shore about Flower cove, coast of Newfoundland.

On the northern shore of the gulf from Eskimo islands to cape Whittle, in calms or easterly winds, the general movement of the water is westward, but in westerly winds it is very variable. Between cape Whittle and Heath point, Anticosti island, the currents are weak and affected by the wind.

Of course the tidal streams through Belle Isle strait affect the currents and they must be considered.

Caution.—The currents along this coast are very variable and uncertain and must be carefully watched.

No lights.—As there is not a single light along this coast westward of Greenly island its navigation is extremely dangerous at night.

Soundings.—The soundings off the coast are generally deep and irregular. From some 25 miles southeastward of Great Mekattina island, a bank, on which the depths are 34 to 50 fathoms with one or two shoaler patches, extends westward parallel to the coast for about 50 miles. There is deeper water between this bank and the northern shore of the gulf, and also for some 30 miles southward of it toward Newfoundland.

Variation of the compass.—It must be remembered that in the 136 miles of coast described in this chapter, the variation of the compass changes 3 degrees—from 33° W. to 30° W. It must also be remembered that in some places there is apt to be local magnetic disturbance of the compass needle. (See p. 38.)

Climate.—The climate is very severe, and the difficulties of navigation are much increased by the fogs which accompany the prevalent southerly winds. It is probable that the mean temperature of the year is not above 32° F. The ice does not usually leave the coast before June, and the young ice begins to form again in the pools and sheltered small bays in September, when frosts are frequent at night. At midsummer only a very few of the earliest plants are found in flower, the grass has not sprung up, and the moss still retains the brown color of winter; large masses of snow continue to occupy the ravines and hollows and the shaded northern sides of steep hills.

In the sheltered bays the temperature is much higher and the fogs less frequent than among the outer islands, while, at the distance of some 15 miles inland, the water is said to be quite warm in summer, and the country thickly wooded with spruce, juniper, birch, and poplar trees, which grow in valleys where the soil is of sandy clay, only the summits of the hills being bare granite like the coast. The climate slightly improves in proceeding to the southwestward.

Inhabitants and productions.—A few Indians of the Montagnais or Mountaineers tribe, may be found on the coast, which is also visited occasionally by a small number of Eskimo families.

There are deer (caribou), bears, wolves, foxes, martens, otters, beavers, and Canadian porcupines in the interior, most of which are hunted for their skins by the few inhabitants of the coast. The Canadian partridge and the ptarmigan, or willow grouse, are also plentiful.

The only permanent inhabitants are a few widely scattered families, residing at seal and salmon fishing, and fur trading establishments, at Bradore, Eskimo bay, St. Augustine harbor, Little Fish harbor, and Etamamu, which are visited periodically by small vessels from Quebec. These are the only people who could be relied on for assistance by shipwrecked crews, except perhaps a family residing on the island between Bonne Espérance and Salmon bay in summer and in Old Fort bay in winter. The remaining two or three families are very poor people, who seem just able to make out an indifferent livelihood by hunting and fishing.

Seals and salmon are very plentiful. Codfish are abundant on the coast, especially eastward of Mistanoque; and the fishery for them is carried on not only by resident inhabitants, but also by vessels which visit the coast every summer.

With its severe and gloomy climate, and producing nothing that can support human life, this is one of the most barren and desolate coasts in the world. In many parts the scenery is not without beauty, but it is of a wild and dreary character, and the only inducement to visit the coast is its fisheries.

For a description of the coast of Labrador to Greenly island and Long point see Hydrographic Office publication No. 73, Newfoundland and Labrador.

Greenly island (île Verte) consists of two hillocks joined by a plateau between two coves, the northern hillock being 84 feet high and the southern 63 feet high. The northern shore is bold, but off the southern are a rock, that dries at low water, and shoals, which together extend $\frac{1}{4}$ mile southward. A large fishing establishment, owned by Job Brothers & Co., is situated in the eastern cove. Greenly island is the resort of puffins, which appear in great numbers suddenly in June and disappear as suddenly in October.

Light.—A white octagonal tower with a circular red lantern, the whole 86 feet high, on the southwestern slope of the southern hillock of Greenly island, exhibits, at 116 feet above high water, a flashing white light, giving 1 bright flash every $2\frac{1}{2}$ seconds, thus: Flash $\frac{1}{4}$ second, eclipse $2\frac{1}{4}$ seconds. The light should be seen in clear weather a distance of 16 miles.

The keeper's dwelling is attached to the lighthouse and is painted white with a red roof.

Fog signal.—A diaphone trumpet operated by compressed air gives during thick or foggy weather 1 blast of 5 seconds duration every minute, thus: Blast 5 seconds, silent interval 55 seconds.

The fog-signal building is a rectangular white building with a red roof, situated 232 yards 125° from the lighthouse and 60 feet back from the water's edge.

The coast from Long point, about $1\frac{1}{2}$ miles north-northwestward of Greenly island, trends northward $\frac{1}{2}$ mile to the rocky pointe à la Chasse, beyond which is Sandy bay; on the southern side of the bay and on the point are a few houses and a small chapel with a flagstaff near it.

Perroquet bank, with $4\frac{1}{4}$ fathoms over it, lies 250° , $1\frac{1}{4}$ miles from Long point.

Perroquet island, nearly 1 mile northwestward of pointe à la Chasse, and about 800 yards off the northern point of Sandy bay, is 61 feet high and about $\frac{1}{4}$ mile across. Its southwestern side, which is fairly steep-to, is faced by cliff; the other sides are foul for a distance of 200 to 400 yards. Numerous puffins resort here during summer.

Bradore bay.—The shore of the gulf trends northward $3\frac{1}{2}$ miles from Sandy bay and thence westward; in the bight thus formed are the island of Ledges and numerous islets and rocks, within which is Bradore bay. The bay is not difficult of access in moderate weather, but it is not suitable for large vessels, as the anchorage space is open to the heavy sea that rolls in with southwesterly winds. Except for vessels able to enter Frigate harbor, or during strong easterly winds, the anchorage is inferior to that of Blanc Sablon, to the eastward.

The land eastward of the bay is for some distance flat and marshy, with several large ponds; beyond this it rises in sandstone terraces to a rocky flat topped knoll, 297 feet above high water.

Two streams, separated by the Bluff peninsula, run into the northern part of Bradore bay; the western stream is marked by a waterfall, and $2\frac{3}{4}$ miles westward of the peninsula is a large waterfall that is conspicuous from seaward.

The land westward of the peninsula rises to a chain of bare stony hills nearly 500 feet in height, behind which are several ponds. Numerous islands and ledges front the coast, with narrow and shallow channels between.

Island of Ledges (Basin island) is of irregular shape, but about 1,600 yards across and 60 feet high; it is separated from the eastern shore of the bay by a channel nearly 1,200 yards wide. Off its eastern coast there is a chain of islets, which are steep-to toward the channel; but between them and the island there are depths of only 6 feet to 3 fathoms. Numerous islets and ledges lie off the southern and western sides of the island, which must not be approached within a distance of $1\frac{1}{4}$ miles.

Several rocks and shoals lie between island of Ledges and the northern shore of the bay, all of which break heavily in bad weather, and entrance to the harbor northward of this island must not be attempted under any circumstances.

Frigate harbor lies at the northeastern part of the island of Ledges, and on its shores are a few houses and fishing stages. The water is sufficiently deep, but the anchorage space is only about 300 yards across.

The Basin lies southward of Frigate harbor and contains a fishing establishment connected with that at Blanc Sablon. This harbor is suitable for only small vessels.

Gull rock, which dries at low water, lies nearly midway between the eastern shore of the entrance of the bay and the islets off the southeastern end of the island of Ledges. Shoal ground extends 200 yards southward from it, and at the end of the shoal ground there is a rock with 6 feet water over it. From close southward of this 6-foot rock a ledge with $3\frac{3}{4}$ fathoms over it extends southward 250 yards.

East rock, with $4\frac{1}{2}$ fathoms water over it, lies 180° , distant $\frac{1}{2}$ mile from Gull rock. Greenly Island lighthouse, bearing 211° , well open westward of Perroquet island, leads westward of these shoals.

Bull rock, on the western side of the channel to Bradore bay, showing 3 feet above high water, lies 340 yards from the southern end of the island of Ledges. From it a shoal, with a depth of 16 feet at its extreme, extends 400 yards southward.

Directions.—To a vessel approaching Bradore bay, Bradore hills, some summits attaining heights of 1,135 to 1,264 feet, are conspicuous, and Greenly Island lighthouse is a good landmark. Avoid Perroquet bank, which is situated 250° , 1.3 miles from Long point, and has $4\frac{1}{4}$ fathoms water over it, by not bringing Greenly Island light to bear southward of 133° until the summit of Perroquet island bears eastward 18° and then steer for a position 281° , $\frac{3}{4}$ mile from Perroquet island; thence steer 4° , keeping Greenly Island lighthouse well open of Perroquet island till past East rock, and not shutting the lighthouse in with the western end of Perroquet island till past the $3\frac{3}{4}$ fathoms shoal southward of Gull rock. The course given leads 375 yards eastward of Bull rock, which is visible, and northeastward of the chain of islets off the northeastern side of the island of Ledges. To anchor in Frigate harbor stand in between the northern of the Green islands, the name of the chain of larger islands eastward of island of Ledges, and Pigeon islet, the rocky islet 19 feet high at the northern end of the chain; large vessels, however, must pass northward of Pigeon islet, avoiding the shoal which extends nearly 200 yards northward of it, and anchor as convenient.

With strong southwesterly winds a heavy swell rolls in between Gull and Bull rocks, and Blanc Sablon bay then affords better shelter and anchorage easier of access.

Tides.—It is high water, full and change, in Bradore bay, at 10h. 35m.; springs rise $4\frac{3}{4}$ feet, neaps $2\frac{3}{4}$ feet; neaps range $1\frac{3}{4}$ feet.

Telegraph station.—There is a telegraph office at Bradore bay.

The land separating Belles Amours bay, Middle bay, and Five Leagues harbor, all just to the westward of Bradore bay, is very remarkable. Low granite country, on which are ridges of boulders, with coarse grass and moss, extends several miles inland to the range of steep granite hills, 400 feet to 500 feet high, which trends westward from the head of Bradore bay. This low country has a green and alluvial appearance from the sea, and not until a near approach is it seen to be rock and boulders.

Belles Amours point, about $6\frac{1}{2}$ miles westward of the island of Ledges, is a mound of bare granite, 60 to 70 feet high, at the south-

eastern end of the low peninsula separating Belles Amours harbor from Middle bay.

Belles Amours harbor.—Stony point, low and green, and Flat rocks, $1\frac{1}{4}$ miles southeastward of it, form the eastern side of Belles Amours bay, and the land from Belles Amours point to Harbor point, trending north, forms its western side. Belles Amours harbor, about $\frac{1}{2}$ mile long, northeast and southwest, and $\frac{1}{4}$ mile broad, with general depths of $4\frac{1}{2}$ to 7 fathoms, lies within and to the southwestward of Harbor point, and is quite landlocked.

Entrance—Shoals.—A rocky patch with 13 feet least water, which sometimes breaks, lies nearly midway between Belles Amours point and Flat rocks, and it divides the entrance of Belles Amours bay into Eastern and Western passages. In Western passage, between the patch and the point, there are some patches with $3\frac{1}{2}$ fathoms, which is as much water as can be counted on in that channel.

Niobe shoal, on which there is a depth of 11 feet, lies about 450 yards southwestward of Flat rocks on the eastern side of Eastern passage.

The ground is foul and the soundings are extremely irregular in Eastern passage.

Harbor point, about $1\frac{1}{2}$ miles north of Belles Amours point, rises to a bare granite hill about 150 feet high, with several beacons of stones upon it. Similar beacons are erected upon almost every hill, and are said to be for the guidance of travelers in winter. The coast of the promontory between Belles Amours and Harbor points is bordered with large boulders, and shoal water extends 300 yards off it; within it is a large and shallow pond. The northwestern side of Harbor point is sand, extending, together with a flat which dries at low water, partly across the inner entrance of the harbor. The narrowest part of the entrance of the harbor, between this flat and the high and bold rocky land to the northward, is 200 yards wide, with 6 fathoms water in it, mud bottom. At about 160 yards northward of Harbor point there is a small rock always above water; at 200 yards farther in the same direction lies another small rock, which dries at low water. There is no passage, except for small craft, between these rocks and Harbor point. The entrance channel passes northward and westward round these rocks, and then southwestward between them and the land to the northward.

On the eastern side of the entrance to Belles Amours bay shoal water and large stones extend from Stony point northward to the point of North cove, which is suitable only for boats.

Directions.—To enter Belles Amours harbor by Eastern passage, approach steering for Harbor point bearing about 315° so as to pass $\frac{1}{2}$ mile westward of Flat rocks. Continue this course, keeping Harbor

point open westward of the western side of Stony point, and not approaching the western side of Stony point nearer than 300 yards. When about 200 yards from the eastern side of Harbor point steer 327° till abreast of the rock above water off the point, when haul a little westward, and bring the eastern side of Harbor point and Pond point (see chart) in line. Keep this mark on astern until Mark point, on the northwestern side of the harbor, comes in line with Peak point, a remarkable rocky point in Middle bay, seen over the low land at the head of the harbor, and bearing 231° , when turn sharp to the westward, keeping at a distance of less than 200 yards from the high northwestern shore until well within the sandy spit, when haul to the southward, and anchor as convenient in 5 to 7 fathoms, mud.

From the westward in approaching Belles Amours point observe the clearing mark for the Middle ledges, and keep Stony point well open of Belles Amours point. In entering by western passage, which is preferable with a westerly wind, pass Belles Amours point at a distance of 400 yards and keep at least 400 yards off the western shore of the bay, until past Pond point; then haul in gradually to within 200 yards of Harbor point, and proceed as before directed. In a sailing vessel, when the marks come on for hauling westward into the harbor, put the helm down and shoot the vessel in as far as she will go, let go the anchor, and warp in to the anchorage; a vessel can sail in only with easterly and southerly winds. The ground is good for anchoring outside Harbor point, but not outside Stony point.

Tides.—It is high water, full and change, at Belles Amours point at 9h. 0m.; springs rise $4\frac{1}{2}$ feet, neaps $2\frac{1}{2}$ feet.

Water can be taken from streams running into the western corner of Belles Amours harbor, and also from a considerable stream flowing into the head of North cove, where there are a few trees. Wood for fuel is scarce in this locality.

Middle point.—From Belles Amours point the southern coast of the peninsula of low land separating Belles Amours harbor and Middle bay trends west-southwestward $1\frac{1}{2}$ miles to Middle point, which has several rocks off it within the distance of 200 yards.

Middle ledges lie within about 1,400 yards southeastward of Middle point; several of them dry at low water, but the outer ledge, which is 1,200 yards offshore, has 15 feet least water on it. There is no safe passage inside the ledges. Stony point open of Belles Amours point, bearing 33° , leads southward of them.

Middle bay is a fine open roadstead, clear of detached dangers, and extending northward 2 miles, with a width of over 1 mile. For 1 mile within the entrance shoal water extends in places about 300 yards off both sides, but farther in it is quite bold, excepting in the

coves. The depth of water in the bay is generally 4 to 13 fathoms, sand; but a shoal with 3 fathoms water on it lies 300 yards southward of the northern entrance point of West cove.

The usual anchorage in Middle bay, in easterly winds, is off Isthmus cove, in 10 fathoms, sand, and in westerly winds off West cove. It may be necessary to shift berth with a change of wind. There are no islands off this bay, and as it is sufficiently roomy for large ships to beat in and out, it affords a very convenient occasional stopping place, and it is the only open roadstead on this coast.

Middle ledges and Barrier reefs are the only dangers in the way of vessels approaching Middle bay either from the eastward or the westward.

Shallop cove, on the eastern side of Middle bay, $\frac{3}{4}$ mile northward of Middle point, is sheltered by three small islets close to the shore, but is suitable only for boats.

Peak Point promontory, which juts about 800 yards into the head of the bay, is high and composed of granite. Its southern end is forked, Peak point, the southeastern part, being a ragged, isolated mound or peak; off the western side at the distance of 100 yards there is a large rock above water.

Isthmus cove, east-southeastward of Peak point, has a depth of 3 fathoms, mud bottom. The cove is small, but two or three fishing vessels occasionally moor in it, under a reef which extends from the southern side of the cove northwestward toward Peak point. The reef affords indifferent shelter from southwesterly winds, which blow right in and cause a heavy sea. The entrance between the reef and Peak point is only 140 yards wide; and there is about the same space between the reef and the shore to the eastward.

To enter Isthmus cove, keep Peak point close aboard, and when 100 yards past it to the eastward, haul sharp round to the southward between the reef and the shore. The part of the cove which runs in northward of Peak point is shoal. From this cove to Belles Amours harbor, across the low isthmus, the distance is less than $\frac{1}{2}$ mile.

West cove is on the western side of Middle bay 1 mile within the entrance. Its head is separated by a low and swampy isthmus from Five Leagues harbor. The anchorage with westerly winds is in 4 fathoms off the mouth of the cove, avoiding the 3 fathoms shoal.

Water can be taken from streams flowing into Isthmus cove and also the head of Middle bay, where are a few small trees.

Five Leagues point, westward $1\frac{1}{2}$ miles from Middle point, is the southern end of a low peninsula, about 1 mile in length and $\frac{1}{2}$ mile broad, which separates Five Leagues harbor from Middle bay. On this peninsula, $\frac{3}{4}$ mile northward from the point, there is a remarkable

isolated and precipitous hill nearly 200 feet high, which is a good mark for Five Leagues harbor from the westward.

Leagues reef, partly above water, extends $\frac{1}{4}$ mile southward from Five Leagues point.

Barrier reefs.—The northeastern end of these reefs lies westward nearly $\frac{1}{2}$ mile from Five Leagues point, and the reefs extend southwestward about $1\frac{1}{4}$ miles. They are in two portions, with a channel $\frac{1}{4}$ mile wide between them, but this channel is difficult, as the reefs overlap. Parts of the reefs are dry at low water and the sea almost always breaks on them. Belles Amours and Ledge points in line, bearing 64° , lead $\frac{1}{3}$ mile southeastward of Barrier reefs.

Five Leagues harbor, situated $\frac{3}{4}$ mile northwestward of Five Leagues point, is $\frac{1}{2}$ mile deep, with $2\frac{1}{4}$ fathoms water, but is not suitable for vessels of over 100 tons. Two small rocks, which just cover at high water, lie west-southwestward of the southern entrance point of the harbor, which is a rocky islet connected to the shore at low water; the outer of these rocks is 320 yards from the point. A considerable swell comes in with southwesterly winds, and, but for the indifferent shelter afforded by Barrier reefs off its mouth, vessels could not lie in the harbor. There are two channels, each about 600 yards wide, leading in; one from the southward through Eastern entrance, between the reefs and Five Leagues point; and one, from the westward, through Western entrance, between the reefs and the shore to the northwestward.

Directions.—Using Eastern entrance, steer about 0° , passing 200 yards southwestward of Five Leagues point and its reef. Leave the two rocks off South point to the northeastward, passing between them and the western point of the harbor, where the channel is 350 yards wide. When past these rocks, haul northeastward into the harbor, passing midway between South point and a large rock above water, 281° , 300 yards from the point. Anchor in the middle, 200 yards within the entrance; for although there is water enough nearly to the head of the cove, and the anchorage is more secure farther in, yet the harbor becomes so narrow that vessels must be moored head and stern, and it requires local knowledge.

Using Western entrance, from westward of Barrier reefs, bring the western entrance point of the harbor to bear 45° , and steer for it. When within the western Barrier reefs, there are two ledges, just under water, and several small islets on the mainland side. Leave the ledges, which can usually be seen, nearly $\frac{1}{4}$ mile to the northwestward, and leave Bis islet, which is bold and is $\frac{1}{4}$ mile offshore, about 1 mile from the entrance of the harbor and opposite the middle of the Barrier reefs, about 200 yards to the northwestward. Pass the western point of the harbor close-to and continue as above directed.

Salmon bay.—Salmon islet bears 248° , $3\frac{3}{4}$ miles from Five Leagues point, and lies close to the southeastern side of Caribou island; shoal water and rocks surround the islet and extend nearly 800 yards eastward of the island. Caribou island is 220 feet high, but from seaward it can not be distinguished from the mainland. Between Caribou island and the mainland eastward of it is the eastern entrance to Salmon bay, 200 yards wide, but only 6 feet deep at low water; the other entrance to this bay, less than 200 yards wide, with a least depth of about 5 fathoms, is from Bonne Espérance bay to the northward of Caribou island. There are two houses just within the eastern entrance of Salmon bay, on the mainland side.

There is plenty of water in the bay, which runs northward some $2\frac{1}{2}$ miles. The chart is the only guide.

Caution.—Soundings in moderate depths of water extend sufficiently far off the shore between Greenly island and Salmon bay to give warning of approach to the land.

Eskimo (Esquimaux) islands commence at Salmon islet and continue westward 14 miles. These islands are of all shapes, sizes, and heights under 200 feet, and are named in order westward Eskimo (Esquimaux), Old Fort, and Dog islands. They are all bare of trees, excepting some that are near the mainland. Many small rocks and ledges lie around and within about $1\frac{1}{2}$ miles seaward of the islands. To attempt to describe all these islands and the channels between them would be useless, and the description would be well nigh impossible. The chart is the best guide, and only the principal shoals and channels, with Bonne Espérance harbor, which is the best harbor in this locality, are briefly described herein.

Whale island, the southern of all these islands, is about $\frac{3}{4}$ mile long, north and south, and about $\frac{1}{4}$ mile broad. It shows as the extreme to vessels close in to the coast, either to the eastward or the westward.

Beacon.—The highest part of the island, which is a round hill near its middle, does not exceed 100 feet in height, and on it there is a white steel tripod beacon, 30 feet high, with slatwork sides.

The island is a good mark for vessels bound to Bonne Espérance harbor.

Whale reef, composed of rocks above and under water, extends 600 yards off the southern point of Whale island; shoal water borders the northern point of the island only to the distance of about 140 yards.

Southwest ledge, with 9 feet water, lies 226° , 700 yards from the southern point of Whale island. There are several rocks dry at low water, lying 200 yards off the eastern side of the same point.

Whale patch, 101° , 1,200 yards from the northern point of Whale island, has a depth of 4 fathoms over it.

Bonne Espérance bay and harbor.—The southern point of Whale island bears 222° , $4\frac{1}{2}$ miles from Salmon islet; and the islands which form Bonne Espérance bay and harbor lie northward of this line. The largest of these islands, being very steep, and composed of bare granite, look much higher than they really are, an effect that is exaggerated by the fact that the islands westward of them are much lower. There are beacons made of piles of stones upon almost every summit.

The whole of Bonne Espérance bay forms an excellent harbor in which there is room for many vessels of large size, in general depths of 12 to 26 fathoms, mud. The harbor itself is a bight, about 600 yards across each way, situated between Bonne Espérance and Grand islands. The main channel leading to the bay is between Goddard and Beacon islets.

Goddard islet is the western of two low islets joined by a reef to the southwestern part of Caribou island. Bold rock at the end of a reef extending 275 yards southward of the southern point of Goddard islet is small, always above water, and quite bold. Goddard rock, 700 yards from the same point, is also small, and dries at low water. The southern end of Red Head island (see chart) open southward of Beacon islet, 242° , leads southeastward of Goddard rock.

Beacon islet, which is low, about 250 yards long, and with a pile of stones on its summit, lies 221° , nearly 1 mile, from Goddard islet. Tail islet lies 400 yards southward, and Link and another low islet northward of Beacon islet. Red Head island lies $\frac{3}{4}$ mile southwestward of Beacon islet. Fish islet, a large low rock, lies between Red Head and Whale islands.

Northward of Red Head island are Chain and Bonne Espérance islands, the former being in two parts, joined by a narrow stony isthmus, and the latter being 150 feet high and $\frac{3}{4}$ mile long. Lion island is $\frac{1}{4}$ mile northeastward of Bonne Espérance island; westward of Lion island there is a low islet and a narrow channel with 12 feet water between the islet and Bonne Espérance island; 100 yards eastward of Lion island lies Whelp rock, always above water.

The main channel, which passes between this rock on the west and Goddard and Caribou islands on the east, is 600 yards wide, with 10 to 13 fathoms water, over rock, sand, and mud bottom.

Shoals.—Middle patch, bearing 146° , 1,300 yards from Beacon islet, has a depth of 4 fathoms over it. There is foul and rocky ground, with depths of 5 to 10 fathoms between Middle and Whale patches, to clear which, in approaching the harbor from the westward, do not reduce the depth to less than 10 fathoms, until the leading marks for hauling into the harbor come on.

Watch rock, $\frac{1}{4}$ mile northeastward of Beacon islet, is small and above water; Breaking ledge, $\frac{1}{4}$ mile, 327° from Watch rock, just covers at high water.

Directions—Main channel.—The prevailing winds are favorable for entering Bonne Espérance harbor.

From the eastward with an easterly wind steer toward Caribou island, and when $\frac{1}{2}$ mile southward of the island stand southwestward with the southern end of Red Head island open southward of Beacon islet 242° , to clear Goddard rock. The depth on the range is about 9 fathoms at low water, until past the rock, when it deepens suddenly to 15 to 19 fathoms in the entrance to the channel; keep the lead going.

When in the entrance, haul in and bring Whelp rock in line with the western side of House island, 337° ; this island is close under the mainland about 1 mile northward of Lion island, and is low, with a house on it, but it is not easily seen. Run in upon this range or bearing until past Bold rock, when haul a little to the eastward, and give Whelp rock a berth of 200 yards. When inside of this rock bear up to 259° and pass between Bonne Espérance and Anchor islands into the harbor, which is 600 yards wide between Bonne Espérance and Grand islands, with a depth of 12 to 16 fathoms, over mud bottom. In the passage between Bonne Espérance and Anchor islands, which is 400 yards in width, the depth is not less than 5 fathoms, except within 100 yards from either side.

From the westward with a westerly wind, pass $\frac{1}{2}$ mile southward of Whale island and steer about 50° , avoiding Whale and Middle patches, until Whelp rock and the western side of House island are in line bearing 337° ; then haul in upon that range or bearing and proceed as before, except that if the wind is not free enough to allow the passage between Bonne Espérance and Anchor islands being used, proceed around Anchor island, and do not close Whelp rock in with the southwestern point of Goddard island until past Anchor reef. This reef, which covers at high water, lies nearly 400 yards northeastward of Anchor island, and the above range leads 100 yards northeastward of it. When the northern end of Anchor island bears 216° , Anchor reef is passed; then haul to the wind, and observing that shoal water extends 300 yards northward of Grand island (the large and high island next westward of Bonne Espérance island), tack into the harbor or anchor anywhere in the bay, completely sheltered. When anchoring in the bay, be cautious, because the depth of water is great and irregular.

Shallop channel, between Bonne Espérance and Grand islands, is very narrow, and has only 2 fathoms in it at low water. It is approached from either side of Whale island, passing Fish islet, and

then keeping the western sides of Red Head, Chain, and Bonne Espérance islands close aboard into the harbor.

Eskimo (Esquimaux) channel leads direct to the eastern entrance of Eskimo bay, and is approached through Whale channel, between Whale and Tent islands, which lie just to the westward. Whale channel is nearly $\frac{3}{4}$ mile wide, and has depths between 10 and 18 fathoms in it. The only covered shoal in it is Southwest ledge, for the rocks, which lie $\frac{1}{2}$ mile southward of Tent island, are partly above water.

The course through the middle of Whale channel, and across the deep, and open space northward of it, to the entrance of Eskimo channel, is 5° . Eskimo channel is between Grand and Fair islands on the east, and Spit and Stone islands on the west; the narrowest part, between Fair and Stone islands, is 150 yards wide, with a least depth of 5 fathoms. Pass through the channel and steer 349° till close to the equally narrow entrance of Eskimo bay; then haul to the eastward through Northwest channel into Bonne Espérance bay, keeping within 200 yards of the mainland, to avoid the shoal which extends from Fair island fully halfway across the channel. Steer for the southern end of the small and high Star island, passing close southwestward of it, and continue toward Anchor island till clear of the shoal which extends 400 yards northeastward of Grand island, when haul southward into the harbor. Eskimo channel might be practicable for steamers of moderate size, but it is too narrow for sailing vessels, excepting small craft.

West channel, between Spit and Stone islands on the east and Eskimo island proper on the west, is suitable only for small vessels, because a 2 fathoms bar extends between Stone island and the western entrance point of the eastern entrance to Eskimo bay.

Tides.—It is high water, full and change, at Bonne Espérance harbor at 9h. 15m.; springs rise 5 feet, neaps $2\frac{1}{2}$ feet.

Water and wood are abundant on the mainland, but not on the islands.

Population.—There were 903 residents in Bonne Espérance harbor and its locality in 1901.

Eskimo bay.—Eskimo island lies in the entrance of Eskimo bay. There are many islands outside it and from seaward it can not be distinguished from the mainland.

The eastern entrance to Eskimo bay is a very narrow channel between the island and the mainland to the eastward. This channel continues northward for $1\frac{1}{2}$ miles, and then opens into a wide space with two islets in it. In the northeastern part of this space is the entrance of Eskimo or St. Paul river, and on a sandy point, backed with spruce trees, on the western side of the river, about $2\frac{1}{4}$ miles

from Eskimo island, there are a house and trading post. The boats of the Gulnare ascended the river for 5 miles above the house, passing through two lakes, in the upper of which there are 26 fathoms water. These lakes are separated by shallow and narrow channels. The river, which is navigated by canoes for many miles inland, abounds with salmon.

Only small vessels can pass through the eastern entrance to Eskimo bay; there is water enough for larger vessels in the western entrance, where there are numerous islands, but the navigation is intricate, and the chart is the only guide.

Telegraph station.—There is a telegraph office of the Canadian telegraph system at the trading post.

Channel.—There is a channel with 3 fathoms water in its shallowest part, and in general with a great depth of water, between Dog islands and the main, through into Bonne Espérance bay; but the chart is the only guide.

Fort rocks—Old Fort bay.—The southern Fort rock lies 252° , 4 miles from the southern point of Whale island, and in this distance there is no navigable channel between the islands, excepting Whale channel. Fort rocks are a number of low rocks extending about 1 mile southward of Old Fort island, which is of moderate height. From this island a number of smaller islands extend northward toward Eskimo bay; from Old Fort island a number of steep and high islands also extend northwestward, with deep but intricate channels between them, leading to Old Fort bay.

Old Fort channel is a wide opening through the outer islands, and the only navigable one through the islands westward of Old Fort island, although there is a passage between these islands and the mainland. Old Fort channel leads in from sea between Fort rocks and Mermot islet, and farther in between Old Fort island and Channel island, with Crumb island to the northeastward. Within the islands is a wide and open space, in the northeastern part of which is the mouth of Old Fort bay, which runs northeastward about 2 miles, with deep water to its head.

From midway between Fort rocks and Mermot islet the course in through Old Fort channel is about 6° , with deep water the whole way. Mermot islet, $1\frac{1}{2}$ miles westward of the southern Fort rock, is low, with a ledge extending $\frac{1}{4}$ mile southward of it. In some places between the islands there is more than 50 fathoms water; and the nearer the main the fewer ledges.

Dog islands.—Northwestward of Mermot islet lie Eider islands, and westward of them are Dog islands, which are surrounded by rocks and innumerable ledges. The southeastern of these rocks lies 231° , $1\frac{3}{4}$ miles from Mermot islet. The southwestern Dog islands are

very low, but those next the main, although small, are of considerable elevation. There is good anchorage between the islands and the main, but it can be reached easily only by running down with a westerly wind from Shekatika (Shecatica) island close along the mainland and in the deep-water channel between the mainland and the scattered rocks and ledges lying off it.

The north shore of the gulf from Dog islands to Shekatika island is composed of steep granite hills, not exceeding 300 feet in height, with deep water close to the land.

Porpoise rocks are three small black rocks above water, lying 4 miles westward of the outer Dog island. The two northern rocks are close together; the third rock is about 800 yards southward of them and $1\frac{1}{4}$ miles offshore. A sunken rock lies $\frac{1}{4}$ mile, 236° , of the northern rock, and a shoal with $3\frac{1}{2}$ fathoms water over it lies 42° , $\frac{3}{4}$ mile from the southern rock.

The passage between Dog islands and Porpoise rocks might be used in clear weather, when shoal water is readily seen, and when the sea is heavy enough to break upon the ledges, but it is safer to pass inside Porpoise rocks and along the land where there are no shoals.

Rocky bay.—The entrance to this bay is about 302° , $1\frac{3}{4}$ miles from the southern Porpoise rock, whence the bay extends, between steep and high rocky shores, north-northeastward $1\frac{3}{4}$ miles, with a width of about 250 yards. Its entrance has a depth of 39 fathoms, but the depth soon diminishes to 16 fathoms, and then decreases gradually to the head of the bay. One mile within the entrance, on the southeastern side, there is a house and fish stage at a little cove, in which small vessels anchor in 5 fathoms, mud, well sheltered from all winds. A small stream enters the head of this bay.

Rock.—There is a rock with $1\frac{1}{4}$ fathoms water over it in the approach to Rocky bay; it is of small extent, and has depths of from 12 to 14 fathoms at a distance of 30 yards around it. The rock is situated on the following bearings: Boulet islet, 258° , distant 2.7 miles; Rocky bay, eastern entrance point, 326° .

Telegraph station.—There is a telegraph office at Rocky bay.

Lobster bay, the entrance to which is about 1 mile westward of Rocky bay entrance, is an inlet extending, between high and steep rocky shores, northward 4 miles, with a width of 375 to 500 yards. In the entrance to the bay there is a depth of 35 fathoms water, which decreases to 14 fathoms half way up, above which there is anchorage to its head, with mud bottom, but completely open to southerly winds. Several very small streams enter the head of the inlet. Two small islets, close off the eastern entrance point of Lobster bay, are left on the starboard hand, entering.

There is nothing in the way in running up either of these bays.

The Boulet, 259° , $3\frac{1}{2}$ miles from the southern Porpoise rock, is a smooth round islet 250 yards across, green at the top, and about 70 feet in height. Crab island lies $\frac{1}{2}$ mile west-northwestward of it, and Four rocks, within which is Inner islet, are 3 miles west-southwestward. These are the only islets along the coast between the Boulet and Shekatika island; but there are many rocks and ledges between them, and also off the Boulet, to seaward. The Boulet will serve to locate approximately a vessel off the coast.

Peril rock, 168° , 1.4 miles from the Boulet, is very small, dries at half tide, and it is the outer shoal and greatest danger off this coast; the sea almost always breaks upon it, and also upon the others which lie between it and Four rocks. The hand lead gives no warning of approach to these rocks.

Napetepee bay, the entrance to which is $\frac{1}{2}$ mile northward of Inner islet, is a straight and narrow inlet, extending, between high and rocky shores, northward $4\frac{1}{2}$ miles. In approaching this bay, Four rocks and Inner islet are left to the eastward.

In entering Napetepee bay pass 200 yards westward of some rocks above water, lying just within the mouth of the bay. At about 600 yards northward of these rocks the bay is 240 yards wide, with high and precipitous shores, especially on the western side. At $1\frac{1}{4}$ miles within the entrance there is a small islet. Pass westward of this islet, and then keep the eastern shore close aboard until through the narrows, which at $\frac{1}{2}$ mile farther in are only 160 yards wide, but the bay soon expands again to 600 yards. The depth of water decreases from 30 fathoms in the entrance to 7 fathoms in the narrows, and then increases to 27 fathoms, with mud bottom. The bay affords no shelter from southerly winds, but much sea can not set into so narrow a place. Several small streams flow into this bay; the principal one being on the eastern side, $\frac{3}{4}$ mile from its head, and it is the outlet of a considerable lake, which can be easily entered by boats only at high water. A river abounding with salmon flows into this lake.

Directions.—Rocky, Lobster, and Napetepee bays have no rocks in them, but being narrow, with deep water, they are by no means desirable places for vessels to go into. A sailing vessel can not get out of them without a northerly wind, which seldom occurs in summer. Lobster and Rocky bays are preferable to Napetepee bay, and the best way to approach them is from the westward with a westerly wind, passing between Shekatika island and Four rocks, and then eastward close along the mainland, between it and Inner islet, Crab island, and the Boulet.

The channel between these islets and the mainland is not less than 600 yards wide, free from danger, and is 33 to 48 fathoms deep, mud bottom.

Shekatika (Shecatica) island, the southern part of which lies 282° , a little over 1 mile from Four rocks, is $\frac{1}{2}$ mile long north-north-west and south-southeast, 200 to 700 yards wide, and 150 feet high.

Mistanoque island, westward of Shekatika island, and separated from it by an unnavigable channel 300 yards wide, is nearly $1\frac{1}{4}$ miles long, parallel to the coast, 400 to 1,400 yards wide, broken into coves on the outside, and in the highest part is 120 feet above the sea.

These islands are close to the mainland and difficult to make out from seaward, but their positions may be known by the Boulet, Napetepee bay opening, and Shag rock.

Mistanoque bay, directly inside Mistanoque island, is about 300 yards wide, with a depth of 23 fathoms in the entrance, and it extends northward 3.1 miles, with a breadth of 550 yards. The depth in the lower part of this bay is from 27 fathoms in the middle to 17 fathoms at the sides close to the rocks; within 800 yards of its head the depth decreases to 12 and 4 fathoms, and affords convenient anchorage. The bottom is mud throughout, and there are no shoals. Wood and water are plentiful.

Mistanoque harbor is a small cove on the northern side of Mistanoque island, situated directly opposite the mouth of the bay, in which the depth is 15 to 20 fathoms, mud. There is, however, anchorage in less water, a short distance eastward, between the island and the eastern point of the bay, where the depth is 12 fathoms, but the channel is there only 160 yards wide. It is necessary to moor.

Mistanoque harbor, though small and with inconveniently deep water, is one of the few ports on this coast suitable for moderate-sized vessels. The absence of shoals in its approach and the easy access in either of the prevailing winds, in consequence of its having two entrances, are great advantages over the other small harbors to the westward.

Enter island lies nearly $\frac{1}{2}$ mile southwestward of Mistanoque island, and Diver island, from which a reef of rocks extends about 300 yards southward, is 400 yards further west; both these islands are low. At 800 yards westward of them, with a navigable passage between, is a group of small islands.

Directions.—The best channel is South passage, between Enter island and Mistanoque island, being 800 yards wide, with upward of 40 fathoms water in it, and bold to the rocks on either side. On approaching West passage of Mistanoque harbor, which is about 150 yards wide, with 9 fathoms water in it, give the northwestern point of Mistanoque island a berth of about 100 yards and keep well over to the mainland side of the entrance; but once in this narrow channel, keep Mistanoque island aboard, because shoal water extends 60 yards off the eastern part of the northern side of the passage.

The approach to East passage, between Shekatika island and Four rocks, which are quite bold, is more than 1 mile wide, with very deep water; but the passage itself, between Shekatika and Mistanoque islands and the mainland, is suitable only for small vessels, being in places only 60 yards wide and having only 3 fathoms water. Give the northeastern point of Shekatika island a berth of 200 yards until the channel between it and the main opens, bearing 258° , for rocks extend 120 yards off that point. Pass the northern point of Shekatika island (on which there is the hut of a seal fisherman) at a distance of about 25 yards, for there is shoal water across a very small bay of the main opposite to it; the channel here is only 60 yards wide, with a depth of 3 fathoms. Thence continue westward through the middle of the passage.

Tides.—It is high water, full and change, in Mistanoque harbor, at 10h. 30m.; springs rise 6 feet, neaps 3 feet.

Caution—Survey.—Captain Bayfield's survey, from the strait of Belle Isle westward, ended at Mistanoque harbor, inclusive, and recommenced again at Great Mekattina island. The intermediate coast was surveyed in 1768 by Lieut. Michael Lane, R. N., and although his survey does not possess exactness, yet it is sufficiently correct for the ordinary purposes of navigation. Still, however, navigation near the land between Mistanoque harbor and Great Mekattina island requires caution, as the survey is incomplete.

All of this coast is now being resurveyed, and the changes will be published when obtained.

The coast between Mistanoque island and cape Mekattina 225° , 43 miles, is broken into considerable bays and inlets, in which are several large islands of moderate height, and partly covered with moss. Many smaller islands, islets, and rocks are interspersed, and there are outlying small islets, rocks, or ledges, in groups, or scattered here and there to seaward. Within the islands, in most of the channels and wide spaces between them, as well as in the bays of the mainland, there is a great depth of water, often exceeding 30 fathoms, and amounting in one or two places to 60 fathoms. In these deep water channels and bays, which are intricate, small rocks are not nearly so numerous as they are outside, and are for the most part above water. Both the mainland and islands are almost everywhere quite bold, and many parts of the channels between and among the islands and rocks are navigable by large ships to anchorage some 15 miles in from the outer rocks. The entrances from sea to these channels and bays, through the outer islets and rocks, are in general intricate, and had best not be attempted except by those having local knowledge.

Shekatika bay lies between Mistanoque island and Cumberland island, which is about $2\frac{3}{4}$ miles to the westward. It extends north-

ward some 7 to 8 miles, and has many islands, branches, and narrow crooked passages, which are too intricate to be navigable without local knowledge.

From Shekatika bay to Ha Ha bay the islands, great and small, and of different heights, are so numerous and so near together that the mainland can not be distinguished until one is among them.

Shag island, 225° , $5\frac{1}{2}$ miles from Diver island, is remarkable, being small and high, with a round peaked hill looking green in the middle. It is the best landmark for making Mistanoque from the westward. Many rocks lie in an easterly direction from this island, the outer of which is Shag rock, $1\frac{3}{4}$ miles distant from the island.

Three rocks are about $2\frac{1}{2}$ miles northeastward from Shag rock and $1\frac{3}{4}$ miles south-southwestward from Diver islet.

Cumberland harbor.—The entrance to this harbor is between Dukes island on the west and Cumberland island on the east, and 344° , 3 miles from Shag rock. It may be recognized by a high and remarkable hill on the mainland bearing 327° about $10\frac{1}{2}$ miles from the entrance; this is the highest hill in the locality, and at the top resembles a castle, having steep cliffs like walls. The islands forming the harbor are of moderate height, Cumberland island, the eastern one, appearing as two round hills. This harbor, the best and easiest of access on the coast, is excellent, and has depth and room enough for large vessels. A small rock lies 158° , about 1,200 yards from the western entrance point, which is about 400 yards distant from the eastern entrance point.

Directions.—In approaching Cumberland harbor pass between Three rocks and Shag rock, and avoid the rock southward of the western entrance point. When within the outer points of the harbor haul over to the western side, and run along it to the inner point on that side, bearing 310° about $\frac{3}{4}$ mile from the outer eastern entrance point; then haul eastward, and anchor in 7 to 20 fathoms of water over good ground.

Water is abundant on the eastern side of the harbor; wood can be obtained from Shekatika bay.

Sandy harbor, on the southern side of Sandy island 299° , $2\frac{3}{4}$ miles from Shag island, is safe with good ground.

Directions.—On approaching Sandy harbor avoid a ledge under water bearing 147° from Shag island, distant 1 mile, and a similar ledge bearing 139° nearly 1 mile from the eastern side of Egg rocks.

A small reef with shoal water extends $\frac{1}{4}$ mile from Shag island toward this ledge, leaving a deep channel between, $\frac{3}{4}$ mile wide. The southwestern extreme of Dukes island, bearing 321° , leads through the middle of this channel.

To enter the harbor pass eastward of Egg rocks, which bear 271° , $1\frac{1}{2}$ miles from Shag island, and close the western extreme of Dukes island. Pass on either side of a small rock above water that lies to the northwestward and toward the eastern side of the entrance of the harbor, and then steer 355° into the harbor, the only rocks being visible. When through the entrance channel, which is about 400 yards wide, haul westward and anchor in 5 to 6 fathoms.

Water is plentiful, but no wood can be obtained in Sandy harbor.

Port St. Augustine has a very narrow and intricate entrance and is fit only for small craft. The approach to the port is westward of St. Augustine chain, which is a chain of small islets, the outer one being a round smooth rock, with a high black rock $\frac{1}{2}$ mile westward of it. Between these last rocks there is a ledge, which shows at one-third ebb. The passage to the port is on either side of this ledge, and then northward along the western side of St. Augustine chain. There is a seal fishing and trading post at Port St. Augustine.

Square channel, the largest channel through the islands toward the mainland, lies between Shag island and the southern extreme of St. Augustine chain, which bears 228° , $6\frac{1}{2}$ miles from Shag island. The channel is very intricate, and at 15 miles up it in a west-north-westerly direction is the entrance of St. Augustine river.

St. Augustine river, a stream of considerable length, flows into a bay full of rocky islands; its mouth is full of shifting sand banks. Small craft anchor in St. Augustine harbor outside the river. The river is formed of two branches, the northwestern and the northeastern, or main river, which receives the tributary, Aux Mouches; both branches are navigable by flats or canoes, but the river sometimes falls very low in summer. At the latter end of June salmon ascend the main river to a distance of 80 miles above the first rapids, and a large number of fish visit Aux Mouches every fall for the purpose of spawning. There is plenty of wood on the banks of this river.

Telegraph station.—There is a telegraph office of the Canadian telegraph system near the junction of the branches and river.

Eagle harbor, in Long island, can be entered only by small vessels, the entrances being very narrow, although there is a considerable deep area within. The eastern passage, between the islets which form the harbor and Long island, bears about 350° , $2\frac{1}{2}$ miles from Fox islands, and is the best, but has a depth of only 3 fathoms water. This part of the coast is dangerous, being bordered with small, low islets and rocks, both above and under water, and a chart upon a large scale is absolutely necessary to enter Eagle harbor. The approach to it, however, is on either side of Fox islands, which are situated southwestward about 12 miles from St. Augustine chain.

Ha Ha bay.—Seal point, about $4\frac{3}{4}$ miles northwestward of Boule islet, which lies close off the northern end of Great Mekattina (Mecat-tina) island, is the western entrance point of Ha Ha bay. The islands to the eastward contract the best channel into this bay to the breadth of about $\frac{1}{4}$ mile, but there is plenty of water, and all rocks show above water. This channel is close along the mainland, between Seal point and Round islet, leaving all the islets and rocks to the eastward. The bay extends northward about 8 miles, with a depth of water of 64 fathoms in one place, and there are many good anchorages.

Fish harbor, situated northwestward $4\frac{1}{2}$ miles from Boule islet, is a small cove of the mainland running in to the southwestward, with Wood islet, which is covered with wood, lying off the entrance. There is a passage on either side of Wood islet, but the northern is the best, as there is a ledge, partly above water, in the bay southward of the island, and a rock, with 2 feet least water on it, lying 220° nearly $\frac{1}{3}$ mile from the eastern point of Wood islet, the other rocks in the approach to this harbor being above water. In the harbor there are 7 or 8 fathoms, with good holding ground; it is, however, suitable only for small vessels, which have room to moor.

Water and wood are obtainable.

Great Mekattina (Mecattina) island, about $3\frac{1}{2}$ miles long, north and south, and about 3 miles wide, is distant $2\frac{1}{4}$ miles from Red point, the nearest part of the mainland to the westward. The central and highest part of the island rises about 500 feet above the sea; the hills, which are granite, are fissured in a remarkable manner by empty basaltic dikes traversing the island, from one side to the other, north and south. Round head, the southwestern end of the island, is a high peninsula connected by a low isthmus to the island.

Boule islet is high, round, and nearly joined to the northwestern point of Great Mekattina island. A small rock above water lies close off its western end, and at 800 yards farther westward is a patch of rocks with about 4 fathoms least water. An islet and small rock lie off the southeastern point of the island at distances of $\frac{1}{2}$ and 1 mile, respectively. Treble Hill island lies 73° , 3 miles from Bluff head, the high northern point of the island: Flat island lies 121° , $2\frac{1}{2}$ miles from its southern point; and the two Murr islets, which are about $\frac{1}{4}$ mile apart, of considerable height, flat at the top, and precipitous all around, lie 191° about $3\frac{1}{2}$ miles from the same point. Treble Hill and Flat islands are bold all around, and so also are Murr islets, which swarm with sea fowl. Murr rocks are two small and low rocks above water, lying 124° about $\frac{1}{2}$ mile from the southern Murr islet. A ledge, on which the sea generally breaks, lies 20° nearly $\frac{1}{2}$ mile from the eastern Murr rock.

Beacon.—A white beacon, consisting of a steel tripod, 30 feet high, with wooden slatwork, stands on Flat island.

Island harbor is a cove, 1 mile deep and about 400 yards wide, between Bluff head and Boule islet. This harbor is sheltered from northeasterly winds by a cluster of small islets and rocks lying off its mouth, on either side of which there is a safe passage. In navigating the eastern passage, keep Bluff head aboard; and in the western passage, pass between the cluster and a small solitary rock, lying $\frac{1}{4}$ mile westward of it, and 200 yards from Great Mekattina island. The anchorage is near the head of the cove, in 14 to 20 fathoms water, over good holding ground, and both wood and water may be obtained there.

Gull islet lies about 267° , $2\frac{1}{4}$ miles from Round head, and a ledge, with 3 feet water over it, is situated 338° 600 yards from the islet. To clear this ledge keep either the mainland or the islet aboard.

Mekattina island lies $\frac{3}{4}$ mile southwestward of Gull islet, and Mutton island, which is quite bold, $\frac{1}{4}$ mile farther southwestward; both these islands are close to the mainland.

Mekattina harbor, between Mekattina island and the mainland, is safe but small, being about 56 yards wide in the western entrance, and about 130 yards wide within. A vessel of any size must moor head and stern, with hawsers also to the shore. The depth in the harbor is 6 to 7 fathoms over good ground, but only 3 fathoms at low water can be carried in through either entrance.

In the small bay between Mutton and Mekattina islands, wherein is the western entrance, there is no anchorage as the water is deep; but there is no danger and it is necessary only to keep in mid-channel to pass safely through.

The mainland directly within Mekattina harbor rises about 700 feet above the sea, and is the highest part of what is named the High land of Mekattina.

Directions.—In the narrow western entrance into Mekattina harbor, keep in the middle.

The eastern entrance is rendered difficult by a reef of rocks under water running northward across it from the northern part of the island, and this entrance should be attempted only with local knowledge. In fine weather there is anchorage outside, between the northeastern end of the island and the main, and a boat can then be sent in to examine the channel.

For the eastern entrance, from the northeastern point of Mekattina island steer about 315° to the mainland, and keep it close aboard until the western point of the island is in line with the mainland point at the eastern entrance; the latter point is the southern point of Dead cove, which is small, open to the eastward, and immediately

northwestward of the eastern entrance to the harbor. Keep this range on until the northwestern extreme of the island and the northwestern extreme of Gull islet are in line. Being then within the reef, haul southward, toward the island, to avoid a ledge which stretches off the southeastern point of Dead cove. When close to the island steer southwestward into the harbor.

Caution.—These directions may be useful to small vessels in light winds, smooth sea, and fine weather; but under any circumstances the slightest mistake or want of care on the part of the helmsman would place a vessel on shore, for the channel is so narrow that there is scarcely room for a vessel to take the turns which are required. Great caution is necessary as the whole of the locality has not been properly examined.

Water and wood can be obtained in Mekattina harbor.

Portage bay, the entrance to which is about $\frac{1}{2}$ mile westward of Mutton island, extends about $1\frac{1}{4}$ miles northwestward, between steep and high granite hills which are traversed by large basaltic dikes. A rapid river flows into the head of the bay. The deep water anchorage space extends only about 400 yards within the entrance, but there is a snug cove on the eastern side for small vessels.

Shoals.—A ledge with 15 feet least water over it lies about 154° , 800 yards from the southwestern end of Mutton island; a similar ledge lies 22° , $\frac{1}{2}$ mile from the southern Seal rock, which is situated near the mainland $\frac{3}{4}$ mile northward of cape Mekattina.

Shoal water extends 200 yards eastward of Seal rocks.

Portage harbor is within a small and moderately high islet in the mouth and toward the eastern side of Portage bay. In this harbor a vessel of considerable size might find shelter in time of need, although it is inconveniently small.

Directions.—In approaching Portage bay, except in a vessel of light draft, avoid the two 15-foot ledges. The passage into Portage harbor, eastward of the islet, has a depth of 2 fathoms water in it, and is so narrow as to be available only for very small vessels. The western entrance is about 200 yards wide, and has a depth of 6 to 8 fathoms in it; and there is deeper water within, mud bottom. By this entrance, haul to the eastward, when within the island, and anchor off the entrance of the cove, or within it, as may suit the vessel.

Portage and Mekattina harbors are much frequented by vessels engaged in the whale fishery. The scenery in both is strikingly beautiful.

Telegraph station.—There is a telegraph office of the Canadian telegraph system near the head of Portage bay.

Cape Mekattina is the southern end of a remarkable promontory of the mainland, which is about $3\frac{1}{2}$ miles in length, and of moderate

height for some distance from its extremity, but it rises 685 feet above the sea about 3 miles northwestward. The granite of this promontory is traversed, north and south, by enormous basaltic dikes which cut completely through the promontory into Portage bay, ascending again on its eastern side, and extending beyond the summits of the hills.

There is a small islet less than 200 yards from the end of the cape with no channel between. Entrance island, about 400 yards across, lies nearly 400 yards farther out. Dyke island is 400 yards farther southeastward, and is composed of two islands at high water, but there is no passage even for a boat between; it is about 1,600 yards long northwest and southeast, 800 yards wide, and 150 feet high. In Dyke island several of the basaltic dikes are empty as low down as the sea level, and divide the island by immense open fissures, so that it can be easily distinguished. Nearly 1 mile southeastward of Dyke island are the two Outer rocks which are above water; and between them and the island there are several rocks and ledges with no safe passage through. All these islands and rocks lie nearly in a line southeastward from the cape, from which Outer rocks are distant 2.4 miles.

There is a clear channel, about 2 miles wide, between Murr islets and Outer rocks, with a depth exceeding 80 fathoms. There is also a safe passage on either side of Entrance island; that between Entrance and Dyke islands being the best, with a depth of 13 fathoms water in it; shoal water extends about 100 yards off the eastern side of Entrance island, but Dyke island is quite bold.

The coast from cape Mekattina to cape Whittle, trending in general about southwest, is as dangerous as can well be imagined to a stranger falling in with it at night or in thick weather, and even to those who are quite acquainted with it the navigation is not easy. There have been instances of vessels, after having beaten about the gulf with adverse winds and bad weather in the fall of the year, being wrecked on this coast.

The distance from cape Mekattina to cape Whittle is 55 miles, but the line between them passes 7 or 8 miles within the outer islands and rocks, so that it is necessary to steer 227° from Murr rocks to pass outside St. Mary reefs, which are the outer dangers off the coast.

The depth of water immediately off, and even within, the outer islands and rocks is in general very great, often exceeding 70 or 80 fathoms, so that there is no warning by the lead; but at 12 or 15 miles offshore there are occasional banks of sand and gravel, with from 30 to 50 fathoms water. The outer islands are entirely bare of wood, but there are more trees on the mainland than there are

in some parts of the coast farther toward the northeastward, indicating a slight improvement in the climate to the southwestward.

Little Mekattina island, the eastern point of which, named point Antrobus, bears 223° , 15 miles from cape Mekattina, is about 7 miles long, north and south, and about 3 miles wide. De Salaberry bay runs in on its western side and nearly divides it into two parts, joined by a very narrow isthmus with De Salaberry bay on the west and bay of Rocks on the east. The greater or southern part of the island is high and remarkable, its highest hill being about 570 feet in height. The part of the island northward of the isthmus is a low and mossy swamp, resting on sand, with isolated ridges and mounds of granite piercing through it in places. Within the island, to the northward and westward, are extensive flats of sand with boulder stones and small rocky islets.

Little Mekattina river flows through these flats by several shallow channels, the largest of which passes into Aylmer sound to the westward, and the shallowest into bay of Rocks eastward of the island. The latter channel has only 3 feet in it at low water, so that it is then possible to wade across it and from the island to the mainland. The river is large, and falls 30 feet over granite a short distance within the entrance and about $2\frac{1}{4}$ miles northwestward of the island.

Little Mekattina island, having thus no channel between it and the mainland available for vessels and scarcely even for boats at low water, may be considered as forming the southwestern side of a large bay. Mekattina promontory forms the eastern side of this bay, which is filled with numerous islands and rocks, among which navigation is impracticable.

Fin rocks lie nearly 250 yards off Whale head, the southern extreme of Gore islands, and 215° , 10 miles from cape Mekattina.

Herriot isles are situated 245° , 2 miles from Whale head; Scale rock, with 2 fathoms over it, lies southeastward 800 yards, and Tail rocks 217° , 500 yards from these isles. Single rock, small and just above water, lies 1,200 yards southwestward of Tail rocks, and a rock, with 3 fathoms over it, lies 174° , 300 yards; another, with 1 fathom westward 300 yards, and a third, with 2 fathoms, 337° , 300 yards from it. Between Herriot isles, with those to the northwestward of it, and Little Mekattina island there is a large open bay, the head of which is bay of Rocks. Point Antrobus, a small peninsula at the eastern end of Little Mekattina island, is the southwestern point of this bay, and a ledge extends 200 yards southeastward from it.

Caution.—Eden islands lie northwestward $1\frac{1}{2}$ miles from Single rock, and all the bay within or to the northward and eastward of this line is full of sunken rocks and shoal rocky patches, which have deep water around them.

Little Mekattina cove, on the eastern side of Little Mekattina island and about $\frac{3}{4}$ mile northward of point Antrobus, is $\frac{2}{3}$ mile long and 140 to 280 yards wide, between high, bold, and precipitous rocks. There is a depth of 10 fathoms water in the entrance and 17 fathoms, mud bottom, within. It is open northeastward, but as the islands are distant only 3 miles in that direction, a vessel well moored would be quite safe in it; it is, however, too small and the depth of water in it is too great for it to be a favorite resort. Cove point, the eastern entrance point, is bold.

Water can be obtained at the head of the cove.

Population.—There were 213 inhabitants in 1901, distributed among the harbors in the vicinity of Little Mekattina island.

Rocks.—The eastern Cat rock lies 17° nearly 1 mile from Cove point, and the western Cat rock is 400 yards southwestward of it; both these rocks are above water. Staff island, 300 yards northwestward of the eastern Cat rock, is about 150 yards across, and at 200 yards eastward of it there is a rocky patch dry at low water, which can be seen from aloft; there is also a ledge with 2 fathoms least water, 320 yards northeastward of the northern end of the islet. From this ledge the eastern extremes of Eden islands and the small and high Nob islet are in line bearing 31° .

Hare harbor.—The entrance to this harbor, between Daly and Price islands, lies about 2 miles northward of Cove point. The harbor, formed between several islands and Little Mekattina island, extends 2 miles north-northwestward, with a width of 400 to 1,000 yards and general depths of 4 to 10 fathoms, but there are several rocks and ledges in it, most of which are visible. The entrance is about 320 yards wide with 20 fathoms water. As the harbor is open to the southeastward, the prevailing westerly or easterly winds are favorable for sailing in, and are generally accompanied with a smooth sea in the entrance; only when the wind is well to the southward is there any swell, and even then it never affects vessels in the harbor.

Rocks.—Watch rock, small and above water, is about 340 yards within the entrance, and about 150 yards off Price island.

Bold islet, 160 yards westward of the northern end of Price island, is very small and steep-to.

Safe rock, 400 yards north-northwestward from the northeastern end of Daly island, is very small, above water, and steep-to on its eastern side.

Rag ledge, nearly midway between Safe rock and Bold islet, just dries at low water. It can generally be seen from aloft, and has clear and deep channels, 300 yards wide, on either side of it.

Foul rock, 329° , 1,200 yards from the southern point of Price island, is a 2 fathoms patch.

Directions.—From the westward pass point Antrobus at a distance of not less than 600 yards, pass eastward of the eastern Cat rock, and not less than $\frac{1}{4}$ mile eastward of Staff island in order to clear the shoals off it.

From eastward of Staff island steer about 0° till the entrance of the harbor bears 306° , when steer directly for it, taking care not to use the channel between Price and Eden islands by mistake, as there are numerous ledges in it. Daly island, on the western side of the entrance, lies close to the shore, with only a boat channel between, which can not be seen through from outside. Its eastern side is steep-to.

Give the southern end of Price island a berth of at least 60 yards. Pass westward of Watch rock, eastward of Safe rock, and on either side of Rag ledge; the channel westward of the ledge is, however, the best, and the course from the center of the entrance through it, so as to pass about 100 yards from Safe rock, is 324° .

When within Rag ledge choose an anchorage by the lead, for there are several patches of rock with 4 to 6 fathoms, although the bottom is generally mud, with 8 to 10 fathoms water. In anchoring avoid Foul rock; and to pass westward of it keep more than half way over between the islands forming the eastern side of the harbor and its western shore, or from the position abreast Rag ledge steer nothing to the eastward of 337° . The most secure anchorage in the harbor is nearly $\frac{1}{2}$ mile northward of Foul rock, and eastward of Cluster point, which consists of some low small islets and rocks extending from Little Mekattina island.

From the eastward, pass $\frac{1}{2}$ mile southward of Fin rocks, about 800 yards southeastward of Scale rock, and $\frac{3}{4}$ mile southeastward of Single rock. Then, steer 295° for a position $\frac{1}{2}$ mile southwestward of Single rock, taking care not to close it within $\frac{1}{4}$ mile, whence make a direct course 305° to the entrance of the harbor and proceed as before directed.

Water, etc.—There is a good watering place in the small cove on the western side of Hare harbor, and wood may be obtained in various places. Two men were some years ago, and may still be, employed in the salmon and seal fisheries, either in the entrance of Little Mekattina river or near Little Mekattina cove, during summer, but they did not remain during winter. There are plenty of blue and cloud berries, etc., on the hills of Little Mekattina island. From the high parts of Little Mekattina island there is a fine and extensive view of very peculiar scenery; the nearer objects are steep precipices, deep glens, and dark stagnant ponds fringed with dwarf spruce, juniper, birch, and poplar, the whole conveying an idea of extreme barrenness.

The south coast of Little Mekattina island, extending from point Antrobus 3 miles southwestward to cape Mackinnon, is high and bold, with remarkable beaches of white boulder stones occasionally. There is a long cove close to the eastward of cape Mackinnon, but it is of no use to shipping.

Aylmer sound is between Little Mekattina island on the east and Harrington islands together with the mainland on the west, and it is navigable northward about 4 miles from westward of cape Mackinnon. Cape Airey, the southern point of Harrington islands, lies 233° , 5 miles from cape Mackinnon, and between them is the entrance to the sound; Craig point is about a mile north-northwestward of cape Mackinnon, and the breadth of the sound from this point, about 266° to Paynter islands, is only 2 miles, and so it continues as far as it is navigable. Paynter islands, 4 miles northward of cape Airey and close to the mainland, are small.

Aid and Close islets, on the eastern side of the sound are small; Aid islet, the outer, lies 295° nearly 1 mile from cape Mackinnon and 800 yards offshore; Close islet lies about midway between the cape and Aid islet, and about 200 yards offshore. There is probably a deep channel between Aid islet and Little Mekattina island.

Spray reef, 256° , $1\frac{1}{2}$ miles from cape Mackinnon, is small, awash at low water, and steep-to around. This is the only reef in the entrance of the sound that is not always visible, and vessels had better pass westward of it, because the passage between it and Aid islet has not been sounded, although it is probably clear and deep.

The only rocks on the western side of Aylmer sound are above water and close to the shore.

Doyle islands, four in number, appear from the entrance of the sound as only two; the two western islands are very low and close together, being joined at low water; the two eastern are of moderate height, and also close together. The northeastern point of the islands bears 352° , 2 miles from Craig point. In the channel between these islands, and also between them and Crescent point, northwestward of them, there are several small rocks and ledges; but the passage eastward of the islands and between them and the ledges which lie across the mouth of De Salaberry bay is safe. This passage is $\frac{1}{2}$ mile wide, with 18 to 23 fathoms water in it, the eastern side of the islands being bold.

Lou road.—From the northern point of the eastern Doyle island, Boot point, the southern entrance point of Louisa harbor, bears 14° , distant 1,200 yards. Within or northeastward of Doyle islands, between them and Louisa harbor, is Lou road, a fine roomy roadstead, with anchorage in 12 to 4 fathoms, mud bottom; the soundings in the road, which is 1 mile long, west and east, and about 1,200 yards broad,

decrease gradually to the westward. The roadstead is bounded on the north by banks of sand and stones, dry at low water, which extend across from Dickson islands, forming the northwestern side of Louisa harbor, to Crescent point. It is through these banks that most of the water from Mekattina river flows to sea.

Louisa harbor is about 400 yards wide at the entrance, which is situated about 4° . 1 mile from the eastern Doyle island, and the anchorage space within, having depths of 3 to 5 fathoms, mud bottom, is $\frac{1}{2}$ mile north and south, and $\frac{1}{4}$ mile east and west. The harbor is open southwestward, but all sea is broken by Doyle islands. The entrance points are quite bold; and the best anchorage is 300 yards within them, in 4 fathoms, and in the southern part of the harbor.

Directions.—Approaching Aylmer sound, keep clear of Block reef, and in the sound guard against Spray reef by bearings of cape Mackinnon, cape Airey, and Paynter islands. There are irregular soundings with as little as 11 fathoms, rocky bottom, here and there in the sound, but generally the depth is 19 to 23 fathoms, rock, sand, and mud bottom. The ground can not be trusted until within Doyle islands. For Louisa harbor, or Lou road, keep the eastern side of Doyle islands aboard, to avoid the ledges lying across the entrance of De Salaberry bay. When inside the islands either anchor in the road or run into the harbor, as convenient.

Harrington islands extend northward 4 miles from cape Airey to the mainland, and there is no channel within them, because of the great number of small rocks. The largest of these islands is about 1.4 miles long, north and south, and $\frac{3}{4}$ mile wide; several of the others are nearly as large. The islands are moderately high, the highest being estimated to rise 300 feet above the sea. Between the outer islands and the largest island there is indifferent anchorage and deep water, but the channels leading to it are so narrow and intricate that it is dangerous to attempt to navigate them except in small vessels and with intimate local knowledge.

Black reef, 166° . 2 miles from cape Airey, is a group of low black rocks above water, about 300 yards across and bold, but with very irregular soundings, of 6 to 70 fathoms, rock bottom, around it.

Major reef, 255° . $1\frac{1}{2}$ miles from cape Airey, is awash at low water, and very small.

Netagamu islands, about west-southwestward $4\frac{1}{2}$ miles from cape Airey, are small; and there is a remarkable mound on the largest. Between these islands and Harrington islands there is a bay of the mainland, with clay cliffs, a sandy beach at its head, and very many small rocks across its mouth.

Netagamu river.—The outer entrance to this river is north-westward 1.6 miles from the western Netagamu island; and a

semicircular bar of sand, dry at low water with the exception of a narrow channel with 3 feet water in it, extends 1 mile from the outer to the inner entrance, and is extremely dangerous to boats because of the heavy surf. The inner entrance has a sandy beach, backed with a thick growth of spruce trees on either side of it. The river is a large stream with deep water from the narrow inner entrance for about 1.4 miles, or close up to the falls, which descend perpendicularly 50 feet, on either side of an island, and into a basin $\frac{1}{2}$ mile wide. These falls can be partly seen from seaward, when bearing about 25° . The current in the river is rapid, and the bottom of the channel is rock; but small vessels can be secured on the eastern side 1 mile within the entrance, where there are two huts, the temporary residence of salmon fishermen during the season. The hills of the mainland, 4 or 5 miles westward of this river, rise 400 to 500 feet above the sea.

St. Mary islands lie 6 miles off the mainland, and their northeastern end bears 218° , 10 miles from cape Airey. These two islands are so close together that they form practically one narrow island extending 214° about 3 miles, of bare steep granite, rising 200 feet above the sea and bold all around.

Cliff islands, 1,400 yards westward of the northwestern point of St. Mary islands, consist of one round and steep island $\frac{1}{2}$ mile across, and several small islets and rocks close westward of it, with deep water between them. A ledge above water extends about 300 yards southward of the western islets, and a small ledge lies about 200 yards eastward of the large island.

Boat islands, the eastern of which bears west-southwestward a little more than $\frac{3}{4}$ mile from the southwestern Cliff island, with a clear channel between, are a cluster of small islands close together, occupying a space $1\frac{3}{4}$ miles long, southwest and northeast, and about $\frac{3}{4}$ mile wide.

Centre reef, 277° , $2\frac{3}{4}$ miles from the northwestern point of St. Mary island, is above water and may be passed on either side at the distance of 400 yards.

Bold rock, southwestward $1\frac{1}{2}$ miles from Centre reef, is above water. There are some sunken rocks in the passage between this rock and Middle islands.

Middle islands are a chain of islands, nearly joined at low water, with several small islets adjacent, covering a space of $3\frac{1}{2}$ miles southwest and northeast and about 1 mile wide. The western island is $2\frac{1}{4}$ miles long and 150 feet high. There is good anchorage in 10 to 12 fathoms between the western island and two smaller islands northward of it; but the anchorage is too small for large vessels and too intricate to be used; it can be approached only from the eastward.

Middle islands lie $1\frac{1}{2}$ miles from the mainland, and there is no safe channel between, owing to the numerous islets and rocks. There is a safe channel, nearly 1 mile wide, between these islands and Boat islands, to the southeastward. In all these channels the soundings are irregular and the ground foul, with a depth in some places of 15 fathoms and in others 40 to 50 fathoms.

Southwest islands.—Numerous detached islets and rocks extend southwestward about $2\frac{3}{4}$ miles from Middle islands. Southwest islands, the southwestern of these islets, are a group of small islets, of which the western is high and round.

Tender reef, 315° , 1,600 yards from the northern St. Mary reef and 222° , $1\frac{3}{4}$ miles from the southwestern Boat island, is small and awash at low water.

St. Mary reefs are four ledges just under water, on some of which the sea always breaks. The northern ledge lies 200° , 2 miles from the southwestern Boat island; two ledges lie 138° , 600 yards and 1,200 yards from the northern ledge; and the southern ledge of the reefs lies 188° , 900 yards from the southern of these two ledges.

There is a patch of 12 fathoms lying 2 miles southeastward of St. Mary reefs and one of 8 fathoms nearly as far southwestward of them.

Channels.—The soundings around and between all these rocks and islets are generally deep and irregular, and no warning of approach to them is given by the hand lead. The channels between Tender reef and Southwest islands, and between St. Mary reefs and Boat islands, are believed to be clear, at any rate, of shoals with 3 fathoms or less water over them; this is because the sea often breaks in that depth, and such breakers have not been seen.

Watagheistic island, lying in the mouth of a large bay of the mainland, is hilly, 3 miles long, northeast and southwest, over $1\frac{1}{2}$ miles wide, and much broken into coves; it is difficult to distinguish from seaward. The eastern end of Watagheistic island bears 329° , $6\frac{1}{4}$ miles from Cliff islands, and between them there are many islets, rocks, and reefs.

Cove island, the largest of these islets, etc., is $\frac{1}{2}$ mile across, and is surrounded with rocks and ledges; it bears 309° , 4 miles from the northern point of St. Mary islands, and there are thickly scattered rocks both above and under water all the way from it to Netagamu islands, $6\frac{1}{2}$ miles northeastward.

Watagheistic sound is a secure harbor between Watagheistic island and the mainland. The eastern entrance is narrow and intricate, but the western entrance is $\frac{1}{2}$ mile wide; and although there are several rocks and ledges in it, it may be used, with proper care, by large vessels.

Montcalm rock is a rock with a flat top about 14 feet across, having a depth of 12 feet over it, lying in the approach to Watagheistic sound, northward of Bold rock, on the following bearings: Bold rock 149° . Mound island east tangent in one with the east tangent of Bare rocks 5° . Most northern island off Seal-net point, north tangent 275° .

Caution.—Watagheistic sound can not be reached without passing through 7 miles of dangerous navigation, which should not be attempted unless absolutely necessary. The use of the following directions must be accompanied with a good lookout from aloft, for it is not certain that all the ledges have been found, although there is every reason for supposing that none have escaped notice.

Directions—Northeastern entrance.—From the westward with a westerly wind, pass between Tender reef and Southwest islands, then between Middle and Boat islands, and southward of Bold rock, steering about 33° , or run down outside St. Mary reefs, and then pass between Boat and Cliff islands, which is the safer route.

Leave Bold rock 800 yards to the westward, the channel between that rock and Centre reef being clear, and steer 330° for a position westward 500 yards from Bare rock. Parts of the reefs extending southwestward from Cove island and parts of Cutter reefs, which lie 298° , about 1.6 miles from Bold rock, are above water, and may be seen when passing them. Black ledge must not be closed, as it has not been examined. Then steer about 347° , direct for Beacon islet, until $\frac{1}{2}$ mile from Beacon islet, when alter course to about 23° and pass the islet, and a reef and a 3 fathoms patch, which together extend 23° , 800 yards from it: then, giving the islet a berth of $\frac{1}{2}$ mile, haul in 306° .

A deep bay lies in the northeastern side of Watagheistic island about 1,200 yards within Beacon islet. Steer for the narrow channel between the northern entrance point of this bay and two small islets which lie nearly 300 yards north-northeastward of it. Leave an islet nearly filling the entrance of another deep cove in Watagheistic island close to the westward, and then steer 281° through the channel between Watagheistic island and the islands to the northeastward, which extend nearly across to the mainland in that direction. Keep rather toward the Watagheistic island side of the channel. The channel is at first only about 170 yards wide, but it soon opens to 320 yards, with a depth of 15 fathoms in the middle, mud bottom, where there is secure anchorage.

To proceed into Upper sound, avoid a reef lying $\frac{1}{4}$ mile northwestward of the northern point of Watagheistic island, and across the mouth of the channel, by turning sharp around the point of the island on the northeastern side of channel and steering 0° . There is no safe channel eastward of Cove island.

Southwestern entrance.—From the eastward with an easterly wind, steer for the northern point of St. Mary islands, pass it at the distance of 400 yards, and then steer 265° to pass about, but not less than $\frac{1}{4}$ mile southward of Centre reef, when shape a course 199° for a position about 800 yards eastward of Seal islets.

These islets form the northern entrance point of Boussier bay, which is full of islets and rocks. In the middle of the channel to the westward between Watagheistic island and the mainland there are two small islets, which in line bear 257° ; the outer of these islets is about $\frac{1}{2}$ mile within the channel; they are $\frac{1}{4}$ mile from each other and quite bold. In line with these two islets and 77° , 700 yards from the eastern one lies Kettle rock, very small and just covered at low water. This rock lies in a line from the western side of Seal islands to a point of a shoal cove on the southern side of Watagheistic island, which is open to the westward: there is a rock awash at 160 yards southward of the western entrance point of this cove and northward of Kettle rock. The channels on either side of Kettle rock, which is quite bold, are each $\frac{1}{4}$ mile wide and are 20 to 26 fathoms deep. Proceed westward through the channel, passing on either side of Kettle rock, and clearing it by not bringing the islets westward of it in line while in its vicinity: pass on either side of these islets, and then haul to the northward and anchor under the southwestern end of Watagheistic island in 17 to 20 fathoms, mud bottom, and well sheltered from all winds.

The channel into Upper sound, northward of Watagheistic island, is navigable throughout for large vessels, with a convenient depth of water and good ground for anchoring, and a chart is the only guide necessary.

Water and wood are abundant. A hunter and salmon fisherman lives in Hamelle harbor, at the northeastern extremity of the sound, and another lives in Boussier bay.

Telegraph station.—There is a telegraph office at Seal-net point (point au Maurier), the southwestern entrance point (on the mainland) of Watagheistic sound.

Caution.—There is no good anchorage on the route to, or outside, either entrance to Watagheistic sound, the soundings being irregular, with deep water and generally foul ground. The breakers on every side, on the numerous rocks and ledges, make the place look, as it really is, extremely dangerous.

The mainland between Middle islands and Wapitagan island, about $8\frac{1}{2}$ miles to the southwestward, is broken into coves, with very numerous islets and rocks, extending some 2 miles off it, among which navigation is practicable only for a very small vessel, with local knowledge.

Etamamu river enters a bay open southward, full of islets and rocks, and situated 4 miles northward of the northeastern entrance of Wapitagan harbor. The river, consisting of a succession of rapids, is generally narrow; it, however, widens in several places, forming lakes with still, deep water. Early in spring or after rain it is almost impossible to ascend the river; at certain seasons of the year, however, a boat can ascend 4 miles from the mouth, but then only with great difficulty. At the mouth of this river there is a trading and salmon fishery post, at which two men reside all the year.

Mistassini reef, a small patch with less than 6 feet water over it, lies 268° , $7\frac{1}{2}$ miles from the southern St. Mary reef, and about 71° , 1.6 miles from East passage into Wapitagan harbor.

South Makers ledge, 241° , $9\frac{1}{4}$ miles from the southern St. Mary reef, with general depths of 10 to 40 fathoms, rock, between the ledge and reef, is a rock, which is never entirely covered when the sea is smooth, extending, above and under water, 270 yards northeast and southwest, and 100 yards northwest and southeast. A patch of 4 fathoms bears 119° , distant 400 yards from it. The soundings are very irregular round the ledge; there are 54 fathoms $\frac{3}{4}$ mile northeastward, and nearly 60 fathoms 2 miles southeastward of it.

Mistassini, or the Great Stone, on the eastern part of Outer Wapitagan islands, 333° , $3\frac{1}{4}$ miles from South Makers ledge, is a remarkable block of granite, resembling a mortar, especially when seen from the southwestward, and has been called the Gun by the fishermen. It is an excellent guide to East passage into Wapitagan harbor, the entrance to which is $\frac{3}{4}$ mile northeastward of it.

Outer Wapitagan islands, which are of bare granite and about 70 feet high, are so close together that they appear like one island, extending 2.3 miles northeast and southwest.

Wapitagan harbor, a narrow channel running between Outer Wapitagan islands and Wapitagan island, which is northwestward of them, is completely sheltered. West passage into the harbor is 2 miles southwestward from the Mistassini.

Cormorant point, the southeastern extreme of Lake island, bears 250° , 1,200 yards from the western extreme of Outer Wapitagan islands. Nearly midway between these points, but northward of the line joining them, there is a small islet which is left to the northward in entering the harbor; the entrance through West passage is sharp round the southwestern extreme of Outer Wapitagan islands. West passage is about 160 yards wide, and East passage is 120 yards wide in places. The harbor is not more than 280 yards wide, except where there are small bays, and, although deep, its navigation is so intricate that it is unsuitable for vessels exceeding 150 tons.

Lake island, on the western side of West passage, is about $2\frac{3}{4}$ miles in length, east and west, and of irregular shape. Its southern coast between Cormorant point and cape Whittle, its western extreme, is very remarkable, running straight about 259° , and being composed of dark red granite craggy cliffs, upward of 100 feet in height, stained white by the cormorants.

Cormorant rocks lie directly between South Makers ledge and cape Whittle, which bears 285° , 6.4 miles, leaving a channel between the rocks and the ledge nearly $2\frac{3}{4}$ miles wide. The soundings in this channel are irregular, varying between 12 and 30 fathoms. A rocky shoal, with 4 fathoms on it, stretches 164° , 350 yards from the southeastern Cormorant rock; another with 2 fathoms lies 35° , 1,200 yards from Nest rock; and a 2-fathoms patch bears 11° , $\frac{1}{4}$ mile from Slime rock, the northeastern Cormorant rock. There is no channel between Cormorant rocks, or between them and Lake island, excepting for small craft, and for those with intimate local knowledge.

Rock.—A rocky patch, with 2 fathoms least water over it, and about 300 yards across, lies 66° , 1.2 miles from Slime rock.

Directions.—In approaching and entering Wapitagun harbor it is necessary to keep a lookout from aloft for shoal water. East passage into Wapitagun harbor, between Outer Wapitagun islands and others to the eastward, has a rock and ledge above water on the western side of its entrance; therefore in entering keep the eastern side aboard, steering about 296° . Three small islets lie $\frac{1}{3}$ mile within the entrance, and northward of them is a cove in Wapitagun island extending westward round a steep rocky point, which has a small sunken rock close off it to the eastward; in this cove there is safe anchorage in $2\frac{1}{2}$ fathoms. To run into the harbor, leave the three islets to the southward, passing close to them and then bear up southward between them and the steep rocky point of the cove. The passage southward of the three islets is only 60 yards wide, and there is a ledge in it, which may be seen from aloft; but the passage to the northward of the islets is much the safer.

To enter Wapitagun harbor by West passage, and with a westerly wind, give a good berth to Cormorant rocks and approach between these rocks and South Makers ledge, steering 330° , so as to pass $\frac{1}{2}$ mile eastward of the eastern Cormorant rock. This rock is about 240 yards eastward of Nest rock, which is covered with birds and stained white by them. Steer now about 316° and pass about 300 yards eastward of the small 2 fathoms ledge, which lies 800 yards northeastward of the eastern Cormorant rock, and also of the 2 fathoms ledge, which bears 11° , $\frac{1}{4}$ mile from Slime rock. Pass not less than 600 yards eastward of Slime rock.

From close eastward of this ledge steer about 310° directly for the islet in the channel between the southwestern extreme of Outer Wapitagan islands and Cormorant point, taking care to pass eastward of Long ledge, which lies midway between Slime rock and Cormorant point, by not opening the high eastern end of Lake island westward of the islet in the channel. Having passed Long ledge, steer about 270° and bring the western end of the islet to bear 330° , and steer for it in order to clear the 7-foot ledge lying 300 yards southward from the southwestern extreme of Outer Wapitagan islands, which should not be approached nearer than 400 yards until this ledge is passed.

The patch which lies 240 yards south-southwestward of the islet is quite bold; and to clear it do not bring the western end of the islet eastward of 330° . When within 400 yards of the islet and the harbor begins to open to the northeastward, if in a sailing vessel, take in the after sail instantly and bear up quickly for the entrance, leaving the islet to the northward. Within the entrances the rocks are bold and the water smooth and there is anchorage anywhere, the general depths being 16 to 20 fathoms. The best berth is in a small bay on the southern side of the harbor, 1,200 yards within West passage, in 7 fathoms. The bottom within the harbor is everywhere mud, but outside it is all rocky, with irregular soundings.

Caution.—In entering this harbor, the vessel, having been placed under proper and reduced sail for the purpose, must be smartly handled, and it is necessary to have a leading wind and fine weather, so that the ledges may be seen from aloft.

Tides.—It is high water, full and change, in Wapitagan harbor at 10h. 30m.; springs rise 5 feet, neaps 3 feet. The streams usually run past the entrances of the harbor, the flood setting westward and the ebb eastward, at rates of $\frac{1}{2}$ to 1 knot; but both streams are much influenced by the winds.

Water can be obtained on Lake and Wapitagan islands; there is no wood on the islands, but it can be procured by sending boats to the mainland, about 3 miles northward of the harbor.

CHAPTER IX.

PROVINCE OF QUEBEC—GULF OF ST. LAWRENCE, NORTH SHORE—CAPE WHITTLE TO POINT DES MONTS, INCLUDING THE MINGAN ISLANDS.

VARIATION IN 1908.

Cape Whittle	30° 20' W.	Sheldrake point.....	26° 30' W.
Natashkwan point.....	28° 20' W.	Point des Monts.....	24° 15' W.
St. Margaret point.....	25° 20' W.		

The coast from cape Whittle, the southwestern point of Lake island to Natashkwan (Natashquan) point, westward 62 miles from the cape, is for the first 49 of these miles composed of granite, which rises into steep hills and ridges, with rounded summits, having morasses and stagnant ponds between them; thence to Natashkwan point it is sand. The mainland is low near the coast, gradually increasing in height toward the heads of the bays, but even there it seldom reaches 200 feet. The innumerable small islands, islets, and rocks which fringe the coast for distances of 5 miles seaward in places follow the same rule, being higher toward the mainland. The islands are bare of wood, and so also is the mainland, excepting up the bays or on sandy tracts, which are always covered with a thick growth of spruce, with occasional birch and poplar.

The appearance of this coast from the distance of about 12 miles is so little diversified that it is almost impossible to distinguish one part of it from another, and only when one approaches within about 4 miles of the outer rocks does its broken and dangerous nature become apparent.

Soundings.—The outer rocks, both above and under water, are so bold that the hand lead gives no warning; but the deep-sea lead will find soundings in moderate, but irregular, depths off all this coast sufficient to indicate approach to it, as these depths are less than 50 fathoms within 5 miles from the outer rocks.

Tidal streams.—The tidal streams are weak and irregular, and they are influenced, both in rate and direction, by the winds.

Navigation.—Although this coast is generally dangerous from its nature, especially at night or in fog, yet with caution and a

constant use of the deep-sea lead it may be safely approached; a vessel may even stand close in to the outer rocks and breakers on a clear sunny day, provided a trustworthy lookout is kept from aloft for shallow water; the bottom can then be seen in about 4 fathoms water.

General remarks.—What was written in the previous chapter concerning fogs, icebergs, climate, inhabitants, etc., applies only in a less degree to the coast now under consideration; and the same caution is necessary on this coast as was enjoined on that between Greenly island and cape Whittle.

Caution—Magnetic variation.—As will be seen by the table of variation given at the head of the chapter, the variation decreases from 30° to 24° , a total of 6° , between the points forming the limits of the coast described. Caution is therefore necessary.

Local magnetic disturbance must also be guarded against along this coast.

Whittle rocks, two half tide rocks situated $2\frac{1}{2}$ miles southwestward of cape Whittle, are the outer of the many small rocks, above and under water, lying to the southward and westward of the cape.

These rocks are all steep, with 20 to 40 fathoms of water between them; small fishing vessels navigate among them, and generally also among the islands and rocks of this coast, by the eye, for every rock upon which such small vessels would strike can be seen in clear weather.

Wireless telegraph.—There is a wireless telegraph station, the call letter of which is WR, at cape Whittle.

Wolf bay, the first inlet of the mainland westward of cape Whittle, is about 7 miles deep north-northeastward; but a number of rocks and ledges and a few shoals under water extend across its mouth from cape Whittle to Wolf island, the channels through them being intricate and deep. If it should be necessary to enter so dangerous a place, it can be done only by looking out for the ledges from aloft in fine, clear weather, or by avoiding the broken water when there is a heavy sea.

Telegraph station.—There is a telegraph office at Wolf bay.

Wolf island, westward $6\frac{1}{2}$ miles from cape Whittle, is about $\frac{3}{4}$ mile long, and from a short distance appears as two hills, about 150 feet high. It is one of the higher and larger of the outer islands in this vicinity, and may therefore be easily recognized.

Outer islet, about 198° , $\frac{3}{4}$ mile from Wolf island, is small and low; it is the outer one of a chain of islands, which extends $4\frac{1}{2}$ miles from the point of the mainland dividing Wolf and Coacocho bays.

Beacon.—A white beacon, 30 feet high, consisting of a steel tripod with wooden slatwork, stands on this islet.

Grange rock, the eastern of three ledges lying off the entrance to Coacoacho bay, is a narrow ridge of rocks about $\frac{3}{4}$ mile long north-east and southwest, with a least depth of 15 feet over it, and is shown by breakers only when there is a heavy sea running. From the southwestern end of the ridge Outer islet bears 11° . There is deep water around the ridge.

South breaker, which also shows only in heavy weather when the sea breaks on it, lies 257° , 2 miles from Outer islet, and has less than 12 feet of water on it. This breaker is near the inner end of a ridge of rocks, which extends south-southwestward $\frac{3}{4}$ mile from it, and has a depth of 16 feet water near its outer end.

Southwest breaker, with only 3 feet of water on it, lies 300° , $2\frac{1}{4}$ miles from South breaker, and 239° , $2\frac{1}{2}$ miles from Audubon point, the southwestern entrance point to Coacoacho bay. There are clear channels between these two ledges, which can be seen from aloft in clear weather.

Coacoacho bay (meaning Great Owl bay) is the only place in this vicinity affording anchorage to large vessels. The approach to the bay on the southeastern side is formed by Outer islet, Wolf island, and the islets and rocks between them and the mainland; and on the northwestern side by Audubon rocks and islets.

The bay may be considered to lie within point Emery, the termination of the low rocks extending about 1,200 yards southwestward from Emery island, which is close off the mainland, southeastward, and point Milne, the western entrance point of the bay northwestward, and the bay extends with a width of about $\frac{1}{2}$ mile north-northeastward 3 miles to Low rocks; it affords anchorage sufficiently sheltered for safety for those vessels having good anchors and cables.

The Basin is an excellent harbor in the head of the bay, and Tertiary Shell bay, an arm extending 34° , is equally as safe as the Basin.

Milne reef, in the inner part of the bay, extends nearly $\frac{3}{4}$ mile 190° from Low rocks; it partly dries at low tides.

Directions.—Coacoacho bay is not at all difficult to enter, although the number of islets and rocks in every direction makes it appear so. To enter through the most direct channel between Grange rock and South breaker; while over 3 miles from Outer islet, bring it to bear 38° and steer for it on that bearing until the vessel is within Grange rock and South breaker, or until Outer islet is distant 1 mile. Then steer 355° and pass 800 yards westward of the rocks which lie about $\frac{1}{2}$ mile north-northwestward of Outer islet, and when abreast of them bring point Emery, the southern end of the low rocks extending from Emery island, in line 8° with the extreme point of the mainland on the western side of the bay near the head.

Steer in upon this range until some rocks, lying a little more than $\frac{1}{2}$ mile 90° from Audubon islets, dry at low water and always visible,

bear about 279° . Then haul to 356° , and leave Emery rocks, which are quite bold, to the eastward, whence proceed, steering 15° into the bay. To pass westward of Milne reef, keep Audubon point shut in behind Milne point and Crocodile islet 209° , which islet is 1 mile within point Milne and close off the northwestern side of the bay. The bottom, outside, is either rock or sand, with a depth of 12 to 30 fathoms; but just within Emery island the bottom is mud, with a depth of 10 to 20 fathoms. The farther in the bay, the better the ground, and the less the swell with southwesterly winds, the only winds that send any swell into the bay. The best berth is on the western side of the bay, $\frac{1}{2}$ mile within Crocodile islet, in 9 fathoms, mud.

For the Basin, keep the northwestern side of the bay aboard until within $\frac{1}{2}$ mile of the island in the head of the bay; then sheer eastward toward that island, to avoid a shoal of bowlders, which extends nearly 400 yards off the western side of the bay. The channel between this shoal and the island is only 200 yards wide, but deep enough for large vessels. Pass 100 yards westward of the island and when abreast its inner end turn westward into the mouth of a small bay where the vessel may anchor in 8 fathoms, mud, quite sheltered. The Basin becomes shoal immediately northeastward of this anchorage where an island lies in Coacocho river entrance.

For Tertiary Shell bay, leave a small rock above water $\frac{1}{4}$ mile within its entrance, to the southeastward; the shores of the bay on either side are quite bold. This bay is about 250 yards wide $\frac{1}{2}$ mile from the entrance, but it becomes wider within, with 5 to 11 fathoms water, mud bottom, and is quite landlocked.

In approaching Coacocho bay from the westward pass between Southwest and South breakers, with the northern end of Wolf island bearing 60° ; or between South breaker and Grange rock as above directed.

Coacocho river flows through a wide and shallow channel full of bowlders, and discharges the waters of a large lake, to which boats can ascend with the tide. Its shores are wooded with spruce trees; water may be obtained near the western side of the entrance.

Tides.—It is high water, full and change, in Coacocho bay at 10h. 30m.; springs rise 5 feet, neaps 3 feet.

There is very little tidal stream in the bay, but weak and irregular flood and ebb streams set through and between the islands.

The coast for 12 miles westward of Coacocho bay, or to the entrance of Olomanoshibo river, or Paint river, called also by the Canadians la Romaine, is bordered by innumerable islets and rocks, which extend about $4\frac{1}{2}$ miles off it.

Olomanoshibo (Olomanosheebo) river, or Paint river, is of considerable size, and falls 20 feet over granite into the head of a bay 4 miles deep but so shoal that boats can scarcely enter it at low water. There is a trading post named la Romaine, of the Hudson Bay company on the eastern side of the river near the falls; neither the post nor the falls can be seen from seaward, being hidden by the islands; but the place may be recognized by the low sandy cliffs, thickly wooded with spruce trees, on either side of the entrance of the bay. The tide flows 2 miles up the river.

Telegraph station.—There is a telegraph office of the Canadian telegraph system at la Romaine, the Hudson Bay Company's post.

The coast from Olomanoshibo river entrance to Washikuti (Washshecootai) bay, a distance of 10 miles, continues broken, and is bordered with islets and rocks.

Treble islet lies about $2\frac{1}{2}$ miles southwestward of Olomanoshibo river entrance.

Loon rocks lie about 253° , 2 miles from Treble islet, 3 miles from the mainland, and are the outer rocks off this coast, and always above water.

Washikuti bay (meaning Cloudberry bay), 10 miles westward of Olomanoshibo river, is $2\frac{1}{2}$ miles wide, and has off its entrance several rocky small ledges which make access to it difficult. The eastern entrance point of the bay has many small rocks and islets off it. Cloudberry point is the western entrance point of this bay, and has some rocks also off it. At 3 miles within Cloudberry point the bay contracts to a very narrow inlet, having several rocks and islets in it, and from 4 to $2\frac{1}{2}$ fathoms water, mud bottom, for 4 miles up, whence it is shallow for 4 miles farther, or to the falls of a considerable river, where there is a trading post and salmon fishery of the Hudson Bay company.

This inlet is completely open to winds from the southwestward, and affords scarcely any shelter for the first 5 miles within Cloudberry point. Vessels of considerable size might find shelter in it in time of need, but it is too intricate for general navigation, and directions for it can not be written. The masters of coasting vessels, who have local knowledge, keep a lookout man aloft when entering the bay.

Rocks.—A rock is reported to lie 192° , $1\frac{1}{4}$ miles from Cloudberry point. A rock, with 6 feet water on it, lies 101° , 1.7 miles from Cloudberry point.

Beacon.—A conical beacon, 25 feet high, stands on an island at the head of Washikuti bay, and this beacon, bearing 15° , leads into the bay clear of all shoals and westward of the 6-foot rock.

Muskwaro (Musquarro) point bears about 262° , $4\frac{1}{4}$ miles from Cloudberry point, and between the two is a bay full of small islets and rocks.

Muskwaro river entrance, where there is a Hudson Bay Company's post, is situated 2 miles 15° from Muskwaro point. The river becomes rapid a short distance within the entrance and is useless except to boats or very small vessels; 6 feet can be carried in at low water, but it is a very intricate and dangerous place. Its position is indicated by the houses on the eastern side of the entrance, and also a remarkable red and precipitous ridge of granite, about 200 feet high, about 2 miles westward of the river.

Telegraph station.—There is a telegraph office at Muskwaro.

Curlew point, 5 miles, 262° from Muskwaro point, is the eastern entrance point of Kegashka bay; and $\frac{1}{2}$ mile off the point there are several bare rocks and ledges always above water. The coast between Muskwaro and Curlew points is very broken and has extending off it, for about $1\frac{1}{4}$ miles, many islets and rocks.

Rock.—A rocky shoal, with 24 feet least water over it, is reported to lie about $1\frac{3}{4}$ miles 195° from Curlew point.

Kegashka bay, situated between Curlew and Kegashka points, is 3 miles wide and $1\frac{1}{2}$ miles deep to the northward. In the western half of the bay there are several small islets, too far apart to afford much shelter from the sea; it is only in the northwestern corner of the bay, within Kegashka Point island, that there is anchorage secure in southerly winds. In this anchorage there is room for several small craft, but for only one vessel of moderate size, and she must moor with open hawse to the eastward, and a third anchor on shore to the southwestward, so as to be able to haul in close under the point when it blows hard from the southward. The depth of water within the islets is 4 to 6 fathoms, fine sand bottom. This is a wild place, although, during summer, small vessels shelter there sufficiently to run but little risk.

Kegashka point is the southern point of Kegashka Point island, which is separated from a rocky peninsula by a very narrow channel, dry at low water; the peninsula is united to the mainland by a narrow sandy isthmus covered with grass. Both the island and peninsula are distinguished by being partly covered with spruce trees. There are also a few spruce trees on an islet, $\frac{3}{4}$ mile westward of the point, and as no other islands on this coast are wooded, the bay may be recognized by the trees. There is a fine sandy beach, and low sandy cliffs in the northwestern corner of the bay; and there are similar cliffs for about 1 mile westward of the isthmus above mentioned. This sandy tract is densely wooded with dwarf spruce, which circumstance also distinguishes this bay, and is the origin of

its name Kegashka, which signifies impenetrable woods. Green island, nearly 1 mile eastward of Kegashka point, is about 600 yards across, and composed of low granite, covered with grass, and is the outer and largest islet sheltering the bay. There are several small islets and rocks inside, or northward, and also eastward of Green island; and Black islet, small and low, lies between it and the north-eastern part of Kegashka Point island.

Directions.—The safest channel into Kegashka bay, between Black islet and Kegashka Point island, is 340 yards wide, with a depth of 7 fathoms water, and quite clear. The other channels have rocks in them. From the westward give Kegashka point a berth of $\frac{1}{4}$ mile, then run 9° along the eastern side of the island, which is quite bold, leaving all the islets to the eastward. Steer between Black islet and the northeastern end of Kegashka Point island, and haul round the latter to the northwestward, at the distance of 200 yards; and when the same distance within it, anchor in 5 fathoms and moor as above directed.

From the eastward, give the low and small islets off Curlew point a berth of $\frac{1}{2}$ mile, to avoid the ledges off them, which dry at low water; then steer to pass not less than 200 yards outside Green island. Keep 285° till the northeastern end of Kegashka Point island bears 330° , then haul in and pass between the northeastern end of Kegashka Point island and Black islet, as above directed, giving the southern side of that islet a berth of at least 200 yards.

There are no ledges or rocks off Kegashka bay entrance, except the reported 24-foot rocky shoal southwestward of Curlew point.

Tides.—It is high water, full and change, in Kegashka bay at 10h. 45m.; springs rise 5 feet, neaps 3 feet.

Water and wood can be obtained on the western shore of Kegashka bay, where there are several Canadian families (consisting of 50 persons) who live by gardening, keeping cattle and sheep, and, in winter, fishing and hunting; their houses are visible from seaward.

Kegashka river has its entrance $3\frac{1}{2}$ miles westward of Kegashka point, and affords shelter only for boats. It falls 40 feet 1 mile within the entrance, where there is a fishing station of the Hudson Bay company; neither the falls nor the house at the station can be seen from seaward.

Rocks and foul ground extend about $1\frac{1}{2}$ miles 173° from the river entrance and its western point.

Telegraph station.—There is a telegraph office of the Canadian telegraph system at Kegashka.

The coast.—At $2\frac{1}{2}$ miles westward of Kegashka river entrance fine sandy beaches, in front of sandy cliffs about 70 feet high, and a country thickly wooded with spruce trees, commence and continue

to Natashkwan (Natashquan) point, a distance of $13\frac{1}{2}$ miles. At about $2\frac{1}{2}$ miles eastward of Natashkwan point the sandy ridge with spruce trees rises into mont Joli, a slight mound about 100 feet high, but very little higher than the rest of the country and scarcely noticeable.

Ruisseau rock, 253° , 8 miles from Kegashka point and about 185° , $1\frac{1}{2}$ miles from the entrance of the small stream named Long river, has only 2 feet water on it. In the vicinity of the rock vessels should not go into a depth of less than 17 fathoms.

Natashkwan point is the southwestern extreme of a remarkable sandy promontory, and the southern point of the northern shore of the Gulf, eastward of the Seven islands. The sandy cliffs end at the point.

Cod bank, 1 mile, 196° from Natashkwan point, is a small shoal with about 4 fathoms on it at low water over gravel bottom.

Natashkwan cod banks.—Parallel to the coast from Muskwaro point to Natashkwan point, and at distances varying from 6 to 11 miles, there are banks of sand, gravel, and broken shells, with a depth of 23 to 40 fathoms water over them, though there are more than 50 fathoms in some places between these banks and the land. Cod-fish are often caught in abundance upon these banks, principally by American schooners.

The coast, trending northwestward $3\frac{1}{2}$ miles, then northward 4 miles and then westward from Natashkwan point to St. Geneviève island, the eastern Mingan island, a distance of 53 miles, is low near the sea, rising a short distance inland to mounds and ridges, which do not exceed 400 feet in height. The land is composed of primary rocks, with the exception of a sandy tract at Agwanus and Nabisipi (Nabesippi) rivers. The sandy tracts are always thickly wooded with spruce trees, and the country generally is here less bare than it is to the eastward.

The coast is broken into many coves and small bays, affording shelter everywhere to boats, and occasionally to very small craft. Small and bare islets and rocks are very numerous along it, but they do not extend more than 2 miles off the mainland.

When there is a heavy sea it breaks on all these rocks, thus indicating their positions, or they can be seen from aloft in clear weather; under other circumstances the land should not be approached to a depth less than 20 fathoms, that depth being in many places not more than 1 mile from the outer ledges.

Banks of sand, gravel, and broken shells, covered with about 30 to 60 fathoms water, extend off this coast for many miles, and there is a deep-water channel between them and Anticosti.

Currents.—The easterly current along the coast in westerly winds has a rate which seldom exceeds $\frac{1}{2}$ knot, and is usually much less, so that a vessel can always make way to windward in moderate weather.

Tidal streams.—Inshore there are weak tidal streams which are apparently very irregular. It is important, however, to remember that there is a strong indraft during the flood into Natashkwan river and the bay off Little Natashkwan river, and that the ebb stream sets strongly about east-southeastward off Natashkwan point, causing in southerly winds a very heavy sea upon the banks off the point.

Southeastward of St. Geneviève island there is a strong indraft toward the channel between that island and the main during the flood or northwest-going stream, the ebb setting strongly southeastward. The rate of these streams seldom exceeds 1 knot an hour.

Natashkwan river (the name meaning "Where the seals land") enters the sea at about 4 miles north-northwestward of Natashkwan point. The mouth of the river, between low sandy points, is 1 mile wide, but is nearly all occupied by a low sandy island, with narrow channels on either side of it. The northern channel is nearly dry at times, but the southern has a depth of 6 feet at low water and 9 feet at high water neaps and 11 feet at high water springs. There is the same depth within, and small vessels lie alongside the steep sandy bank on the southern side of the river $\frac{1}{2}$ mile within the entrance, where are the houses of the Hudson Bay Company's post. The bar of sand, on which there is usually a heavy surf, extends out $\frac{3}{4}$ mile, and is so steep to seaward that there is a depth of 20 fathoms $\frac{1}{4}$ mile off it. Codfish are taken in great numbers off this bar in June, and the river abounds with salmon.

The river above the trading post is full of sand banks, dry at low water, and navigable for boats only for a few miles to the first rapids, above which and about 12 miles inland from the entrance it is said to become lost in a great morass. It discharges a great quantity of water in spring. The sandy beach trends northward for $3\frac{1}{2}$ miles from the entrance and terminates at the mouth of Little Natashkwan river, a small stream, which admits boats only at high water. The islets and rocks off the entrance of the river form the eastern side of Little Natashkwan harbor entrance.

Telegraph station.—There is a telegraph office of the Canadian telegraph system at Natashkwan.

Little Natashkwan harbor, formed by a number of islets and rocks, is suitable only for vessels not exceeding 100 tons. The entrance of the harbor lies about 4 miles northward of Natashkwan river bar, and Central reef of rocks, which is situated in it, has a channel on either side; these channels are not more than 180 yards

wide, between reefs, the extent of which, under water, can not be seen, because the water is discolored by the dark streams of the neighboring rivers.

The depth that can be carried at low water through the western channel is 3 fathoms, and that through the eastern channel is 5 fathoms. The anchorage space within the reefs is about $\frac{1}{4}$ mile across each way, and has depths of 3 to 5 fathoms, over sand and mud bottom. This anchorage is sheltered by the main and islets from all except southerly winds, in which direction there are reefs of rocks, parts of which are always above water. With a strong southwesterly wind some sea comes over these reefs at high water, but never enough to endanger a vessel during summer. There are several rocky patches, with $2\frac{1}{2}$ to 3 fathoms over them, off the mouth of the harbor; these, with the want of space to work in, and the difficulty of getting out with the prevailing southerly winds of summer, render this place of little general use; but it is a valuable harbor for the fishermen, whose schooners of 30 to 100 tons are well suited to the size of the place, which is contiguous to excellent fishing ground, and affords every facility for drying fish.

Light.—A square, white lighthouse, 32 feet high, situated at the southwestern extremity of the western and largest island on the eastern side of the entrance to Little Natashkwan harbor, exhibits at 33 feet above high water a fixed white light that should be seen in clear weather a distance of 11 miles.

Sphinx rock, about 150 yards southwestward of the southwestern point of the western islet off the entrance of Little Natashkwan river, is a pinnacle with 9 feet water over it, and a depth of 5 fathoms at the distance of 20 yards around it.

Central reef is about 350 yards long, north-northeast and south-southwest, and 200 yards wide, within depths of 3 fathoms, and it is partly above water. The rocks above water are bold to the southward and also to the eastward, but shoal water extends 140 yards north-northeastward, and about the same distance west-northwestward from the northern rock above water.

Directions.—The harbor should not be entered without a pilot.

Bring the lighthouse at Natashkwan to bear 3° and steer for it until the vessel is in 12 fathoms water, and the southeastern of the rocks at the termination of the sandy beach bears 53° . Then steer 346° for Beacon islet, the southern large islet on the western side of the harbor. It is of gray granite, rather high and round backed, with a wooden cross on it.

This course leads about 100 yards to the southwestward of a $2\frac{1}{2}$ -fathom shoal lying about 203° , 450 yards from the lighthouse and about 200 yards eastward of the shoals on the western side of the harbor. But

the course must not be trusted to clear these reefs, as it passes so closely to them, and it is necessary to use great caution, and look out for the reefs and conn the ship from aloft. If the weather is not clear it might be necessary to mark the reefs.

On approaching Central reef steer to pass through the fairway of the channel either eastward or westward of it, as may be preferred. In the eastern channel give the eastern side of the rocks of Central reef above water a berth of about 100 yards, bearing in mind, in hauling round the northern and northeastern ends of the reef, that it extends under water northeastward 140 yards from the rocks above water.

In the western channel give the rocks of the reef that are above water a berth of 200 yards, and use great caution in passing the 15-foot northwestern extreme of the reef, which is about 140 yards from the northern rock of the reef above water, although vessels of little draft can pass over the northwestern part of the reef. The 3 fathoms channel here is only about 120 yards wide.

The best anchorage berth is nearly in the middle of the harbor, in 4 fathoms, sand and mud bottom, with the rocks of Central reef that are above water bearing 183° , distant 360 yards, and Beacon Islet cross 269° .

Tides.—It is high water, full and change, in Little Natashkwan harbor at 11h. 0m.; springs rise 5 feet, neaps 3 feet.

Inhabitants.—In 1901 probably about 365 people resided in this locality, and the majority live on the eastern side of Little Natashkwan river, where there is a Roman Catholic church. There is a Jersey establishment on the north shore of the harbor.

Washtawooka bay (meaning Crooked bay), 5 miles westward of Little Natashkwan harbor, is full of small islets, rocks, and ledges, which afford shelter to shallops and boats, but render the bay very intricate and dangerous. Shag islet, about 134° , $1\frac{1}{2}$ miles from a projecting point of the mainland eastward of the bay, is a large black rock, and the outer of the rocks in this direction; but foul ground extends 196° , 1 mile from the same point.

Agwanus river, about 275° , 3 miles from Washtawooka bay is a large stream, with rapids and falls at $1\frac{1}{2}$ miles from the entrance, which is narrow, and has 6 feet in it at low water. There is no bar, but many small rocks, above and under water, extend $1\frac{1}{2}$ miles off its mouth, and render the approach extremely dangerous. The eastern entrance point is of rock, the western of sand, and there is a small islet $\frac{3}{4}$ mile within the mouth of the river. Depths of 9 to 12 feet can be carried up to this islet, above which the river expands into a basin, $\frac{1}{2}$ mile wide, with a depth of 5 fathoms close up to the foot of the rapids. A sandy beach extends from $1\frac{1}{4}$ miles eastward of this river westward to Nabisipi (Nabesippi) river.

Telegraph station.—There is a telegraph office of the Canadian telegraph system at Agwanus.

Nabisipi (Nabesippi) river (meaning Man river), which is small and admits boats only in fine weather, enters the sea at a sandy point, 5 miles westward from Agwanus river. On the western bank, a short distance within the entrance, stand a house and store, the trading post of the Hudson Bay company, which is visible from seaward.

Pashashibu (Pashasheeboo) bay, about 297° , 6 miles from the entrance of Nabisipi river, is open to the south-southeastward and difficult of access.

Mushkoniatawee bay, westward about $2\frac{3}{4}$ miles from Pashashibu bay, is 400 yards wide, with 5 fathoms water in and beyond the entrance; it is open to southerly winds, but is tolerably secure for small craft, which lie close to the rocks.

Washatnagunashka bay, about 5 miles farther westward, is $1\frac{1}{4}$ miles wide, with a chain of rocks above and under water across its mouth, which chain does not afford shelter, yet the rocks in it are so close together and so numerous that any attempt to pass through is attended with great difficulty and danger. There is a depth of 3 fathoms in the entrance, and 4 to 5 fathoms inside.

All three of these bays are small and full of small islets and rocks, which render navigation at their entrances difficult and dangerous. They are occasionally, but not often, entered by small coasting vessels, whose masters are intimately acquainted with the coast, and well they may be, for only those who know every rock and ledge could take a vessel in.

Watshishu (Watcheesho), about 275° , 5 miles from Washatnagunashka bay, is a granite peninsula, 127 feet high, and bare of trees. From a distance seaward it appears like an islet, higher than the rest of the islets in the vicinity. There is a fishing post of the Hudson Bay company in a cove among the rocks westward of it. The peninsula and Saddle hill, 332° , nearly 6 miles from it and 374 feet high, are both very remarkable and serve to indicate to a vessel off the coast her position.

Telegraph station.—There is a telegraph office at Watshishu.

Quetachu Manikuagan (Quetachoo Manicouagon) bay, 4 miles westward of Watshishu, is $2\frac{1}{2}$ miles wide, and has depths of 3 to 14 fathoms, but is so full of rocks and ledges as to be useless, except to small craft, and is open to the southwestward.

Piashti (Peashtebai), westward of Quetachu Manikuagan bay, is a much smaller bay, capable of affording shelter only to boats, and open to the southward.

Telegraph station.—There is a telegraph office of the Canadian telegraph system at Piashti.

Appeetetat bay, 8 miles 263° from Piashti, is full of rocks, with ledges under water off, and also within, its entrance. A depth of 4 fathoms can be carried into this bay, but it is not used even by small vessels, because there is an excellent harbor within St. Geneviève island, only 3 miles westward of it.

Tides.—It is high water, full and change, at East point, Appeetetat bay, at 11h. 10m.: springs rise about 5 feet, neaps 3 feet.

The Mingan islands are of limestone, containing ammonites, orthoceratites, and other organic remains, many of which are similar to those of Anticosti. This limestone dips slightly to the southward, so that the islands are bold, and frequently cliffy, on their northern, eastern, and western sides, while they are low and shelving toward the south, in which direction there are reefs of flat limestone and other shoals. Ancient beaches, formed of water-worn pebbles of limestone, and flower-pot rocks, precisely similar to those which are forming at present, out of cliffs that are washed by the waves, are met with in most of the islands, far above the level of the highest tides.

It is estimated that these islands nowhere rise over 300 feet above the sea, and generally they are much lower; although possessing very little soil, they are thickly wooded with spruce, birch, and poplar, on the side toward the mainland; but toward the sea barren tracts often occur, composed either of bare limestone or of banks and ridges of limestone gravel.

The coast of the mainland from St. Geneviève island westward to Mingan river is in some places granite and in others limestone, the latter rock lying immediately over the former; while from Mingan river to river St. John it is of sand and clay, low and thickly wooded, and with a fine sandy beach. About 7 miles inland and north-northeastward of Large island hills rise 1,000 feet above the sea. Mount St. John, 1,416 feet high, about 18 miles farther northwestward, is the highest point of the mainland in this locality. With these exceptions, the mainland is low, and it is particularly so abreast the eastern islands, where the hills are far back in the country.

Local magnetic disturbance. (See p. 38.)

Supplies.—Wood and water can readily be obtained from the principal Mingan islands; wild berries are abundant in their season, and so are different kinds of wild fowl. Quadrupeds are scarce; but there are plenty of seals upon the limestone reefs, and a few codfish off the coast.

Tidal streams.—The tidal streams are not strong among Mingan islands, the rate not exceeding 1 knot, except in very narrow chan-

nels. They are much influenced by the winds, but in fine settled weather there is a constant alternation of the flood and ebb streams between the islands and the main, and also within 2 to 3 miles southward of the islands.

St. Geneviève island, the eastern of the Mingan islands, is about $1\frac{1}{2}$ miles across either way. Its northeastern point is a bluff headland, and the end of the highest part of the island, which is about 200 feet above the sea, and slopes irregularly to the southward.

Mount St. Geneviève, situated about 1 mile inland from the north shore of the gulf of St. Lawrence, and 337° , $2\frac{1}{4}$ miles from the northeastern point of St. Geneviève island, is an isolated limestone table hill resting on granite, and 332 feet high.

East Saint and West Saint are two low and bare rocks, nearly 600 yards apart on the bearing 254° and 74° , and lying a little more than $\frac{1}{2}$ mile southward of St. Geneviève island. The channel between them and the island has a depth of 5 fathoms, but the ground is foul, and sunken reefs extend from both East and West Saint from 600 to 800 yards southward, southeastward, and southwestward.

Bowen rocks are two sunken patches lying 293° and 113° 1,200 yards from each other.

The northwestern Bowen rock, with 3 feet least water, lies 81° , 1.1 miles from East Saint, and with the southern side of East Saint in line with the middle of West Saint.

The southeastern Bowen rock, with 6 feet least water, lies 93° , 1.7 miles from East Saint, which is just open northward of West Saint. These rocks lie also nearly in a line from the southeastern point of St. Geneviève island, at distances of 1.3 and 2 miles, respectively. The soundings between and close to Bowen rocks, and also for rather more than 1 mile southward of them and Saints rocks, are extremely irregular, varying from 4 fathoms, rock, to 43 fathoms, sand, sometimes in a distance of 300 yards. This locality should be considered dangerous and should be avoided by mariners.

Hunting island, nearly 1 mile westward of St. Geneviève island, is about 3.8 miles long east and west, and $1\frac{1}{2}$ miles wide; it is low, thickly wooded, broken into many coves, and fringed with small islets and rocks on all sides, except toward the mainland. Off the southwestern point, $1\frac{1}{2}$ miles, lie Wood and Gun islands, leaving no passage between; reefs extend southward nearly 800 yards from Wood island and 400 yards from Gun island. Both these islands are low, and Gun island is bare of trees, but covered with grass and peat, in which innumerable puffins burrow and rear their young.

Garde rock, rather more than 1 mile southward of the middle of the southern coast of Hunting island, is above water and is the termination of a long ridge of sunken rocks, one of the many ledges that

lie off the southern side of Hunting island. Several reefs also lie off the southeastern end of the island, within a distance of $\frac{3}{4}$ mile.

There is no safe navigable passage between Garde rock and Hunting island.

Collins shoal, 157° , $3\frac{1}{4}$ miles from the southeastern point of Hunting island, is a small patch of rocks, with 12 feet least water over it. From the shoal the eastern point of St. Geneviève island is just open eastward of West Saint, bearing 11° , and the northern point of Wood island is in line with the southern side of Garde rock, bearing 288° .

Caution.—The soundings are irregular, from 4 to 17 fathoms over rocky bottom, between Collins shoal and the reefs off the southeastern point of Hunting island, and unknown rocks may exist there; mariners, therefore, should not use this locality for navigation.

St. Geneviève and Betchewun harbors.—St. Geneviève harbor is situated between St. Geneviève island and the mainland, and Betchewun harbor between Hunting island and the mainland. Both are excellent harbors, not difficult of access or egress, and are available for large vessels. They are reached through two channels, East and Saints.

East channel lies between the northeastern end of St. Geneviève island and the mainland, where the distance across is about 1 mile, but the navigable width of the channel is reduced to about $\frac{1}{2}$ mile by the rocks and shoal water off Ledge point, which is formed of numerous blocks of granite close together. From Ledge point shoal water extends directly across Pillage bay to Partridge point.

Saints channel lies between St. Geneviève and Hunting islands. The breadth of the channel in the approach, between the shoal off West Saint rock and the shoals off the southeastern part of Hunting island, is nearly 1 mile; the breadth of the channel between the reef off the southwestern point of St. Geneviève island and Hunting island is $\frac{1}{2}$ mile. This is the narrowest part of the channel, and everywhere within this channel the ground is good for anchoring, and so little sea comes in that the whole space may be considered a large and deep harbor.

There is an inner harbor at Betchewun westward of Low islet, but the channel westward from it, between Hunting island and the mainland, is suitable only for boats.

Directions.—**East channel** is the best with easterly winds, and may be used with moderate westerly winds during the flood tide by vessels that can work in so narrow a channel; but great care is necessary in standing northward, especially off Ledge point.

With an easterly wind, while well seaward of Bowen rocks, bring, and approach with, the northeastern point of St. Geneviève island in line with Indian point, a low wooded point of the mainland, form-

ing the eastern entrance point of Pillage bay, bearing 298° . This range leads $\frac{1}{2}$ mile northeastward of Bowen rocks, and passes them in 20 to 30 fathoms water, over fine sand and coral.

When the southeastern point of St. Geneviève island and West Saint come in line, steer a little toward the north, so as to give a sufficient berth to a flat shoal, which extends nearly 600 yards from the northeastern side of St. Geneviève island. Round the northeastern point of St. Geneviève island at the distance of 200 yards, pass close to the shingly northern point of that island, and anchor in 10 fathoms, mud bottom, midway between the northern point of St. Geneviève island and Anchor island, which lies 400 yards northward of the northwestern point of St. Geneviève island.

To proceed to Betchewun harbor, pass northward of Anchor island, which is quite bold on that side, and steer for the entrance of Betchewun harbor, which is between the northern point of Hunting island and Partridge point. Mount Partridge, on the northeastern part of Partridge point, is a wooded and steep sided hill; the northeastern point of Hunting island is a cliffy mound, with a cove on its eastern side; this point is bold, and must be passed close-to, in order to avoid the shoal which extends 600 yards southward of Partridge point, and diminishes the navigable breadth of the entrance to 700 yards. From the entrance steer for Low islet, which is in the middle of the harbor, and anchor with its southern end bearing 252° , distant 600 to 800 yards. The depth of water in the harbor is 9 to 18 fathoms, mud bottom.

Saints channel.—While well seaward of Collins shoal, not less than 5 miles from St. Geneviève island, bring and approach with the western points of St. Geneviève and Anchor islands in line, bearing 332° , until the northern extremes of East and West Saints rocks are in line, bearing 74° . The eastern extremes of mount Partridge and of an island joined to Hunting island at low water are then also in line, bearing 300° ; keep this last range on, and steer southwestward of a reef extending 550 yards from the southwestern point of St. Geneviève island, until the eastern extreme of mount St. Geneviève, seen over the sandy southeastern point of Anchor island, is in line with the western point of St. Geneviève island, bearing 0° . Then steer 331° through the middle of the channel, and proceed either to St. Geneviève harbor, round Anchor island, giving its western end a berth of 400 yards, or to Betchewun harbor along the northeastern side of Hunting island, which is bold-to. The above route leads through the channel in not less than 20 fathoms water until about $\frac{1}{2}$ mile from Anchor island.

Tides and tidal streams.—It is high water, full and change, in Betchewun harbor at 11h. 30m.; springs rise 5 feet, neaps 3 feet.

The tidal streams between St. Geneviève and Hunting islands and the mainland are much influenced by the winds; but the rate seldom amounts to 1 knot, and is usually much less, excepting through the shallow and narrow channel at the western end of Betchewun harbor, where there is at times a complete rapid.

Water and wood can be procured.

Telegraph.—There is a telegraph office at Betchewun.

Charles island is 3 miles long, west-northwest and east-southeast, and $1\frac{1}{2}$ miles wide. It is about 200 feet high, generally bold and cliffy; but about 157° , $\frac{3}{4}$ mile from its eastern point there is a patch of rocky ground with 5 fathoms least water, as yet found; there may, however, be less water, and the locality should be avoided.

Puffin bay lies between Hunting and Charles islands, and its entrance, between Gun island and the eastern point of Charles island, is nearly $2\frac{1}{4}$ miles wide, and open to southerly winds. In the north-eastern corner of this bay is the narrow entrance (between shoals off Ragg point and Hunting island) to Ragg bay, which has tolerable anchorage in its northwestern part, but has very deep water on the side toward Hunting island; Ragg bay is separated from Betchewun harbor by the reefs between the island and the main.

The only directions necessary for Puffin bay are to steer 0° fairly between the eastern point of Charles island and Gun island and look out for the shoal water at the head of the bay.

Anchorage.—Within the eastern point of Charles island and midway toward Shoal cove, at 400 yards from the island, there is good anchorage in 7 fathoms, mud bottom; but southeasterly winds send in a considerable swell.

Charles harbor, between Charles island and the main, is $\frac{1}{4}$ mile wide and $\frac{3}{4}$ mile in length, but its entrances are only 160 yards wide. The depth in the harbor is 4 to $6\frac{1}{2}$ fathoms, mud bottom, and in both entrances 7 fathoms, but there is a depth of only 4 fathoms in the approach through Puffin bay. The harbor is quite secure.

The tidal streams, when influenced by strong winds, occasionally have a rate of 2 knots in the entrances of the harbor, but generally the streams are weak.

Whale island, $\frac{1}{4}$ mile eastward of Ammonite point and $\frac{3}{4}$ mile westward of Charles island, is bold and cliffy on its southern and eastern sides, but there is shoal water between the island and the mainland northwestward of it.

Trilobite bay, between Charles and Whale islands, is an excellent anchorage, well sheltered from all but southerly winds. The bay is connected with Charles harbor by a deep but very narrow channel, and from the eastern entrance into Charles harbor shoal water

extends about 1,200 yards off the mainland to the westward, and nearly fills up the northern part of the bay. The only directions necessary for Trilobite bay are to steer 0° fairly between Whale and Charles islands and look out for the shoal water at the head of the bay.

Directions.—For Charles harbor from Puffin bay, approach with the northeastern point of Charles island, which is high and cliffy, bearing 286° : round it at distances of 200 to 350 yards, and haul westward into the harbor.

From Trilobite bay, round the northern point of Charles island, which is the southwestern entrance point of the harbor, at a distance of 120 to 280 yards, and steer about 99° into the harbor. This entrance of the harbor is too narrow for convenient use.

Ammonite reef, which includes a small islet, extends $\frac{1}{2}$ mile southward of Ammonite point. Gun island open southward of Charles island leads about $\frac{1}{4}$ mile southward of the reef; and the northwestern point of Charles island well open southward of Whale island leads southeastward of it. This last range is useful only to vessels standing into Trilobite bay.

Clearwater point, about 2 miles westward of Ammonite point, is low, and shoal water extends 600 yards southward of it.

The coast between this point and Eskimo (Esquimaux) point, bearing 286° , $6\frac{1}{2}$ miles from it, forms a bay, the shores of which are high and conspicuous cliffs of limestone. or of sand and clay. Shoal water extends a considerable distance from the shore all around this bay; and north-northeastward of Sea Cow island the 3-fathom line of soundings is 1 mile from the sandy beach.

Tides.—It is high water, full and change, at Clearwater point at 11h. 30m.; springs rise 5 feet, neaps 3 feet.

Clearwater shoals.—A rocky 3 fathoms shoal lies 247° , $1\frac{1}{2}$ miles from Clearwater point; there is a similar 3 fathoms shoal at $1\frac{1}{2}$ miles, another of 2 fathoms at 1.8 miles, and a third of 3 fathoms at 2 miles, 271° from Clearwater point.

Clearing marks.—The northern point of Fright island in line with the southern extreme of Eskimo island, and open southward of Green island, bearing 280° , leads close south-southwestward of these shoals; and the southern points of Gull and Fright islands in line, bearing 278° , lead $\frac{1}{2}$ mile south-southwestward of them.

Walrus island.—The southern point of Walrus island lies 269° , $4\frac{1}{4}$ miles from Clearwater point, and the island is about 1,400 yards long, north and south, 500 yards wide, steep and precipitous, except at its southern end, from which a reef extends 400 yards.

Sea Cow island, 400 yards north-northeastward of Walrus island, is nearly 1 mile long, north-northeast and south-southwest, $\frac{1}{2}$ mile

wide, steep and precipitous, except to the south-southeastward, in which direction a reef extends $\frac{3}{4}$ mile.

Sea Cow channel, between the shoals off Sea Cow island and Clearwater shoals, is 1.3 miles wide and is clear; in proceeding through it to Eskimo harbor from the eastward, pass southward of Clearwater shoals and approach with the northeastern points of Walrus and Eskimo islands in line, 302° ; when the northern point of Fright island is in line with the southern point of Eskimo island, 280° , steer about 329° and round the northeastern side of Sea Cow island at a distance of not less than 400 yards, whence make a direct course to the entrance of the harbor.

Walrus channel, between Walrus and Green islands, is the best in easterly winds, being nearly 1 mile wide, with 8 fathoms least water. Approach this channel with the northeastern point of Eskimo island bearing 332° .

When Eskimo Point range lights come into line, steer for them 344° , and so into the harbor.

Green island, westward nearly 1 mile from Walrus island and eastward 800 yards from the southeastern point of Eskimo island, is small, low, and covered with grass, with reefs stretching northward and southward nearly 600 yards from it, but bold on its eastern and western sides.

Gull island, about 211° , $\frac{1}{2}$ mile from the southeastern point of Eskimo island, is small, low, and covered with grass; there is no navigable passage between it and Eskimo island. The southern point of Gull island is bold, with deep water 400 yards from it.

Eskimo (Esquimaux) island, the southeastern point of which lies 273° , 6 miles from Clearwater point, is 2.6 miles long, east and west, $1\frac{3}{4}$ miles wide, and 200 to 250 feet high toward its northern side, sloping to the southward. From the southwestern side of the island extends a shoal the extreme point of which bears 217° , $\frac{1}{2}$ mile from the western point of the island.

Eskimo harbor lies between Eskimo island and Eskimo point, on the mainland, including the shoals which extend from the point across the bays on either side. Eskimo point, having the outlet of a small river on its western side, is composed of sand, and is quite bold to the southward. The northeastern and northwestern points of Eskimo island are also bold, with deep water 140 yards off them. The anchorage space within this secure harbor is nearly $1\frac{1}{2}$ miles long, east and west, with an average breadth of 800 yards, and a depth of 5 to 15 fathoms, sand bottom. It is advisable to anchor within the line joining the northwestern and northeastern points of the island, and in not more than 11 fathoms water, where there is shelter from all winds.

Range lights.—A pole standing 75 feet back from the water's edge on Eskimo point exhibits, at 38 feet above high water, a fixed red light, that should be visible in clear weather a distance of 7 miles.

A similar pole, situated 159 yards 344° from the first pole, exhibits, at 58 feet above high water, a similar light to the first.

The two lights in line 344° lead through Walrus channel into Eskimo harbor.

Tides and tidal streams.—It is high water, full and change, in Eskimo harbor at about 0h. 30m.; springs rise 6 feet, neaps $3\frac{1}{2}$ feet. The flood tidal stream usually sets westward and the ebb eastward, with a rate of about 1 knot, in Eskimo harbor and off the coast in its vicinity. The streams are much influenced by the winds, and the ebb sometimes attains a rate of 2 knots in westerly winds.

Eskimo point is the chief town on the northern shore of the gulf, and it contains a Roman Catholic church, a convent, a hospital, stores, etc. It is an important trading post for the traffic of fish, furs, and oil.

There were 1,818 residents at Eskimo point in 1901.

Communication.—A vessel of the North Shore Steamship line leaves Quebec about every ten days during the navigable season for Eskimo point.

Telegraph station.—There is a telegraph office of the Canadian telegraph system at Eskimo point.

Pier.—There is a pier at the town, 185 feet long, with a depth of 24 feet at its outer end at low water.

Water may be procured from the river at Eskimo point, or from small streams on the island, and wood is plentiful.

Fright island, west-southwestward nearly 1 mile from the southwestern point of Eskimo island, is about $\frac{2}{3}$ mile long, north and south, and 800 yards wide; it is clear at 200 yards off its southern and southwestern sides; but reefs extend 400 yards off its eastern side, 500 yards off its northwestern point, and 700 yards off its northeastern point.

The channel between the reefs off Eskimo and Fright islands, leading northeastward toward Eskimo harbor, is nearly 800 yards wide, with deep water, but as there are no leading marks for it and the reefs on either side are extremely dangerous it is not recommended.

Quin island, northward 800 yards from Fright island, is nearly $1\frac{1}{4}$ miles long, north and south, about 800 yards wide, and it is bold, with the exception of Quin reef, which extends westward $\frac{1}{2}$ mile and northward 200 yards from its northern point.

The northern point of Sea Cow island open northward of the northern point of Eskimo island 99° leads northeastward of Quin reef.

Fright channel, between Quin island and the reefs off Fright island, is deep, but only 400 yards wide. It is not recommended, but if necessary to use it with a westerly wind when proceeding to Eskimo harbor, haul up eastward of Niapisca island, till the southern end of Quin island is in line with the southern side of the cove on the north-western side of Eskimo island, bearing 87° . then pass close round the southern side of Quin island, which is quite bold, and thence direct to the harbor.

Quin channel, the best when approaching Eskimo harbor from the westward, is 1,400 yards wide between Quin island and point aux Morts on the mainland, but reefs on either side reduce the navigable breadth to 900 yards. The depth in the channel is 5 to 7 fathoms over rock, gravel, and sand bottom. Shoal water extends southward 400 yards from point aux Morts, and the small islets westward of it.

The northern and northeastern points of Eskimo island in line 106° leads south-southwestward of the shoal off point aux Morts.

Having passed Quin island steer to round the northern point of Eskimo island at the distance of 300 yards, and thence into the harbor.

Niapisca island is about 2 miles long, north-northeast and south-southwest, $\frac{3}{4}$ mile wide, and rises in three principal hills to about 200 feet above the sea; it is only partly wooded. Reefs of flat limestone extend $\frac{1}{2}$ mile southward and southeastward from the island, and between its eastern and southeastern points a remarkable group of flower pot rocks stands on the limestone just above high water mark. A reef extends $\frac{1}{2}$ mile northeastward from the eastern point of the island, which is the southern point of a bay. Reefs also extend 600 to 800 yards from the western side of the island.

Niapisca channel, between Niapisca and Fright islands, leads to the entrance of Quin channel, which turns eastward to Eskimo harbor: it is the best with westerly winds, and should be used. The channel between the reefs of Fright island and those off Niapisca island is 1 mile wide in its narrowest part, with deep water.

In running for this channel from the westward, approach with the northwestern point of Fright island in line with the southeastern end of Quin island 46° ; this range leads 400 yards southward of Niapisca reefs. Be careful, therefore, not to open those islands clear of each other until Moniac island ($2\frac{1}{2}$ miles north-northwestward of Niapisca island) is open to the eastward of Niapisca island. As soon as that has happened steer about 5° through the channel, and when Moutange island (next westward of Moniac island) opens northeastward of Niapisca island, steer 304° and pass eastward of the reef extending northeastward from the eastern point of Niapisca island. Now haul up to the westward, if necessary, to clear Quin reef, not only

until the northern point of Eskimo island is open northward of Quin island, but also until the northern point of Sea Cow island is just open northward of Eskimo island 99° , and steer through Quin channel. Having passed Quin island, continue the course toward the northern point of Eskimo island. Steer to round it at the distance of 300 yards and into the harbor.

Tidal streams.—In Niapisca channel the stream sets northward during the flood, and southward during the ebb, but these streams are much influenced in rate, direction, and duration by the winds.

Moniac island, 349° , $2\frac{1}{2}$ miles from Niapisca island, is 600 to 1,000 yards across. Shoals extend about 400 yards southward of the island.

Moutange island, $1\frac{1}{2}$ miles farther westward, is $\frac{1}{2}$ to 1 mile across. It is situated off a bay full of little islets, and into which several small rivers flow. Shoals extend 600 yards southward of the island.

These two islands are distant $\frac{3}{4}$ mile from the mainland, but shoals within and between them nearly dry at low water; and rocky ground, with irregular soundings of 4 to 10 fathoms, extends 1 mile southward of both islands.

Sand Lark reef, 276° , $3\frac{1}{4}$ miles from Moutange island, and rather over 1 mile from the mainland, is small and low. Shoal water extends 200 yards off the reef, but its northern side is steep-to.

A rocky patch with 5 fathoms water over it, lies 101° , 1.4 miles from the reef or in a direct line from the reef to the southwestern side of Moutange island; as this locality has not been carefully examined, it should be avoided.

Quarry island, 2.3 miles long, east and west, with an average width of $1\frac{1}{4}$ miles, and about 200 feet high, is separated from Niapisca island by a channel nearly 800 yards wide, with a small islet in it, but no safe, navigable passage, because of a shoal in the bay to the southward, and of a reef which stretches eastward beyond the small islet. Reefs also extend 800 yards from the southeastern side of Quarry island.

The eastern part of the island is a peninsula and much smaller than the western part. The southwestern point is a small, narrow peninsula.

Quarry cove, on the northern side of Quarry island and $\frac{2}{3}$ mile northwestward of the eastern end of the island, is about 450 yards wide, and 800 yards deep, with 22 fathoms water in the entrance, shoaling gradually to 5 fathoms, with mud bottom, close to its head. The islands and shoals along the mainland are 3 miles northward of this cove, which thus becomes completely landlocked, but forms a very

small harbor. In entering keep the western side of the cove close aboard, and anchor near the middle in 9 to 10 fathoms.

Water can be taken from a small stream in the southwestern corner of Quarry cove.

Quarry channel, between Quarry island and Large island, which is about 800 yards to the westward, is clear, with a navigable breadth of about 650 yards. Approach with the channel bearing 354° , and then steer through its middle on that course until 1,200 yards within the southwestern point of Quarry island; then keep that island close aboard, as it is quite bold on that side to the northward, while shoal water extends 300 yards from Large island.

The flood stream sets northward through this channel, and the ebb southward; the rate of both streams is about 1 knot.

Large island, of an oval shape, $3\frac{3}{4}$ miles long, north-northeast and south-southwest, $2\frac{1}{2}$ miles wide, and attaining a height of about 200 feet, is thickly wooded. Reefs of flat limestone extend about $\frac{3}{4}$ mile off its southern and southwestern points, and 300 to 800 yards off its western side. The range for the southern end of these reefs in 2 fathoms is the southern points of Niapisca and Fright islands in line 79° . On the western side of the island, 1 mile northward of its southwestern point, there are many flower pot and arched rocks standing on the flat limestone above the present high water mark.

The western side of the island is bold northward of the flower pot columns.

Middle reef, 276° , 2.3 miles from the southwestern point of Large island, and just within the line joining the southern points of that island and Mingan island, is $\frac{1}{2}$ mile long, nearly north and south, and 600 yards wide. The central point of the reef, about 60 yards across, is above water. The eastern side of the two Birch islands in line 346° leads close along the eastern side of the reef in 4 fathoms.

Outer Birch island, 1 mile northward of Middle reef, is about 1 mile across and 300 feet in height; it has a remarkable flower pot rock on its southwestern point. Its eastern side is quite bold, but reefs extend 250 yards off its northwestern and southern sides, and nearly $\frac{3}{4}$ mile southwestward of the island.

Inner Birch island.—The body of this island is about 1 mile long, nearly west and east, and a little more than $\frac{3}{4}$ mile wide; its western point is long and low, extending $\frac{1}{2}$ mile westward from the body of the island, with a curve to the southward; off this point a reef extends $\frac{1}{2}$ mile westward, and there is deep water 200 yards from its extreme.

Hulk rock.—One-half mile southward of the same point lies a small low islet, close to the southern point of which is a very remarkable rock named Hulk rock, from its resemblance to a hulk.

This islet and rock are connected to the low western point of Inner Birch island by a reef of flat limestone, dry at low water, which extends 600 yards south-southwestward, and 400 yards westward from the rock. Shoal water extends 300 yards off the eastern side of the islet.

From the southern point of Inner Birch island shoal water extends $\frac{1}{2}$ mile southwestward.

The channel between Birch islands is 600 yards wide, but the ground is all foul, and not more than 4 fathoms could be carried through without local knowledge.

Large channel, between Middle reef and Birch islands on the west and Large island on the east, is 1.7 miles wide, and has deep water; it should be used by vessels proceeding to Mingan harbor with an easterly wind. Those using this channel must look out for the reef off the southwestern side of Large island.

There is little warning by the lead of approach to the Large island side, but $\frac{1}{2}$ mile eastward of Middle reef there are depths of 13 fathoms. (See Birch channel, p. 394.)

Middle Reef channel, between Outer Birch island and Middle reef, is almost 1 mile wide, with depths of 12 to 30 fathoms.

Those using the channel must beware of the reef on the southwest side of Outer Birch island.

Tidal streams.—The flood stream sets southwestward between Birch islands, and also through Middle Reef channel.

Harbor island, 1.7 miles northward of Inner Birch island and about 400 yards off the mainland, is 1.8 miles long, east and west, $\frac{1}{2}$ mile broad, composed of limestone, about 100 feet high, thickly wooded, precipitous and bold on its northern side, but shelving and shoal for $\frac{1}{4}$ mile to the southward from the shore of the island. Reefs extend $\frac{1}{4}$ mile off the eastern and western ends of the island.

Wacouta rock, situated with the eastern point of Harbor island bearing 51° , distant 1,600 yards, is about 200 yards in length, east and west, and quite narrow, with a depth of 10 feet over it. Close on its northern side there is a depth of 5 fathoms, but its southern side slopes gradually into a depth of 3 fathoms.

The rock is smooth, flat on top, and sharp at the ends which drop gradually into deep water.

Mingan harbor is the narrow and well sheltered space between Harbor island and the mainland, which is low and has a fine sandy beach.

The mainland recedes from the island in the eastern part of the harbor, which would be open to easterly winds but for a sandy shoal, dry at low water, which extends 1,400 yards from the entrance of Mingan river, and affords protection from eastward. Mingan river

is capable of admitting boats only at high water, and its mouth is northward of the eastern end of the island. The eastern entrance of the harbor, between the above sandy shoal and the island, is 400 yards wide; the western entrance, between the mainland and the island, is nearly as wide, the whole breadth in both entrances being in deep water. The anchorage space in the harbor is about 1 mile long and $\frac{1}{4}$ mile wide, with depths of 9 to 13 fathoms over fine sand.

Although the entrances are narrow, there is little difficulty in taking in a vessel of moderate size.

Directions.—Approach Mingan harbor from the eastward, with the northern side of Harbor island bearing 289° , and the houses of the Hudson Bay Company's post open fully their own breadth northward of the island. Steer for those houses so open, leaving the eastern end of the island 300 yards to the southward, but keeping Sandy point on the mainland, at the western entrance of the harbor, shut in behind the northern side of the island, for these points in line lead over the southwestern part of the sandy shoal off Mingan river. After passing the eastern end of the island, run along its northern side at the distance of 200 yards, and anchor anywhere near the middle of the harbor, in 9 to 13 fathoms, sand bottom.

From the westward, run in toward the sandy beach of the mainland at about $\frac{3}{4}$ mile westward of the island, until Sandy point, on the mainland, at the western entrance of the harbor, is in line with the face of the clay cliffs eastward of the Hudson Bay Company's houses, bearing 71° . Run upon this range along the beach, pass Sandy point at the distance of 100 yards, and anchor as above directed.

Mingan harbor is quite secure, and like Eskimo harbor, it has the advantage that vessels can enter or leave it with either easterly or westerly winds.

Tides.—It is high water, full and change, in Mingan harbor at 1h. 16m.; springs rise 7 feet, neaps 4 feet.

Communication.—A vessel of the North Shore Steamship line leaves Quebec about every 10 days during the season and calls at Mingan harbor.

Telegraph.—There is a telegraph office of the Canadian telegraph system at Mingan.

Mingan island, $3\frac{1}{4}$ miles westward of Hulk rock, and $4\frac{1}{2}$ miles westward of Outer Birch island, is $1\frac{3}{4}$ miles long, north and south, and, including two small islands close to its western side, nearly 1 mile broad; it is about 100 feet in height and bare of trees. Shoal water extends only 600 yards off its southern point; but to the southwestward and westward, the reefs, including the islets, run out nearly 1,200 yards. On its northern and eastern sides the island is bold.

Birch channel, between Birch islands and Mingan island, is the best channel by which to proceed to Mingan harbor with westerly winds, as it is 3 miles wide, deep, and clear of dangers.

Mingan patch, 191° , 3 miles from the southern point of Mingan island, and with the southeastern point of Outer Birch island in line with the northern point of Large island, is a patch of rocky ground, with 9 fathoms water on it, but with a heavy swell upon it at times. Between the patch and the island there are depths of 13 to 22 fathoms water.

The Perroquets, the western islands of the Mingan group, are four small islets, low, and bare of trees, lying in two groups $\frac{1}{2}$ mile apart northwest and southeast. The northwestern islet is the highest of the four; it is surrounded with cliffs, and has a superstratum of peat on its flat top, in which great numbers of puffins burrow and rear their young. The other islet of this group is 300 yards to the southeastward. Shoal water extends off the northwestern islet $\frac{1}{4}$ mile both eastward and westward, but at 400 yards northward of it there is a depth of 14 fathoms.

The two eastern islets have a reef of flat limestone extending 1,400 yards southward, and there is a shoal 600 yards northward of them, and a narrow channel between them and the other two, but it should not be used for navigation.

Light.—A square white lighthouse, 55 feet high, with a red lantern, and with a dwelling attached, on the northwestern Perroquet islet, at 83 feet from the northern cliff and 228 feet from the western cliff, exhibits, at 87 feet above high water, a revolving white light which attains its greatest brilliancy every 30 seconds, and should be seen, in clear weather, a distance of 15 miles.

Mingan island intercepts the light between the bearings of 270° and 293° .

Perroquet channel, between the Perroquets and Mingan island, is $1\frac{1}{2}$ miles wide, with depths of 15 to 39 fathoms near its middle. Through the channel the flood stream sets south-southwestward, and the ebb south-southeastward.

Mingan channel lies between Niapisca island and the other islands of the Mingan group westward of it, on the south, and the mainland and Moniac, Moutange, and Harbor islands, on the north. The islands on the southern side of the channel are bold on their northern sides, but on the northern side of the channel uneven and rocky ground extends about a mile southward of the islands. When working in the channel vessels should not stand northward beyond $1\frac{1}{4}$ miles from the outer islands or into less than 10 fathoms. (For Wacouta rock, see p. 392.)

Soundings.—Banks of soundings, with less than 30 fathoms water, extend southward of the Mingan islands, for a distance of 3 miles from Walrus island, and 5 miles from Mingan island. There is much greater depth of water in some of the channels between the islands than there is on these banks.

The coast of the mainland from Mingan harbor to Long point, $5\frac{1}{2}$ miles to the westward, is a fine sandy beach. There is a fishing establishment on Long point.

From Long point, a broad beach of fine sand reaches to St. John river, and an irregular band of shoal water extends for $\frac{3}{4}$ mile outside this beach.

Immediately westward of Long point a sandy shoal of 1 to 9 fathoms extends off the beach to within 1 mile of the Perroquets. There is often a great ripple off this shoal caused by the flood or west-going stream being turned to the southwestward by Long point.

Communication.—A vessel of the North Shore Steamship line leaves Quebec about every 10 days during the season and calls at Long point.

Telegraph.—There is a telegraph office of the Canadian telegraph system at Long point.

St. John river.—This large stream flows into the gulf at $6\frac{1}{4}$ miles 307° from the northwestern Perroquet. It is occasionally frequented by fishing schooners early in the season, and boats have ascended its course for 6 miles, carrying a depth of 1 to 3 fathoms at low water. Above this point there is no tide and the river becomes too rapid to be navigated, except by canoes or flat bottomed boats. The course of the river, for several miles above the entrance, is between high cliffs of stratified sand and gravel over clay, with occasional small sandy islands: and at some 16 miles from the sea, following the stream, there are said to be high falls over granite rocks. The country on either side is covered with a thick growth of small spruce trees. The entrance of the river, between the clay cliffs on the western and a sandy point on the eastern side, is 260 yards wide. Immediately within the entrance the breadth increases to nearly $\frac{1}{2}$ mile, and then decreases again gradually, but is nowhere less than 200 yards in the first 6 miles.

There were two log houses on the right bank $\frac{1}{2}$ mile within the entrance, where a party of men occasionally resided to fish for salmon, and vessels anchored close to them in 2 fathoms at low water.

Bar.—An extensive bar of sand, $\frac{1}{2}$ mile outside the entrance, shifts with every gale of wind, and has seldom more than 3 feet over it at low water. Southerly and westerly winds cause a heavy surf which renders the bar impassable.

Anchorage.—There is good anchorage outside the bar, which may be safely approached by the lead, the soundings decreasing gradually from 20 fathoms at $2\frac{1}{2}$ miles to 3 fathoms at $\frac{3}{4}$ mile from the mouth of the river, over sand and clay bottom.

Tides.—It is high water, full and change, at the entrance of St. John river at 1h. 20m.; springs rise 7 feet, neaps 4 feet.

Communication.—A vessel of the North Shore Steamship line leaves Quebec about every 10 days during the season and calls at St. John river.

Telegraph.—There is a telegraph office at St. John river.

Mount St. John, at 12° , 11 miles from the entrance of St. John river, is an isolated saddle backed hill, 1,416 feet high.

The coast between St. John and Magpie rivers is white cliffs, with a superstratum of sand, which is fast consolidating into sandstone by means of the red oxide of iron furnished by numerous small streams.

Magpie bay is 8 miles wide between St. John river and Magpie point, which bears 272° , $7\frac{3}{4}$ miles from the river. There is good anchorage with offshore winds in the bay, and vessels may stand in to 7 fathoms at low water in every part of it, but southerly and westerly winds roll in a very heavy sea.

Magpie river, the entrance to which is nearly in the middle of Magpie bay, and 295° , 5 miles from St. John river entrance, is a large and rapid stream. with several rocks above and under water off its eastern entrance point, and nearly $\frac{3}{4}$ mile offshore.

The entrance of this river, between steep rocks, is only 60 feet wide, and the ebb stream rushes out of it in a torrent 5 fathoms deep. At 300 yards within this narrow entrance the river falls about 30 feet over granite rocks. There are 7 to 9 feet at low water over the bar outside, but this river is of no use for navigation even by boats.

Range lights.—At Rambler cove, Magpie bay, in front of Magpie village, just eastward of Magpie point, a pole standing 50 yards back from the water's edge exhibits, at 58 feet above high water, a fixed red light that should be visible in clear weather a distance of 9 miles.

A similar pole, situated 93 yards 305° from the above pole, exhibits at 113 feet above high water a similar fixed red light. A white diamond shaped slatted target has been attached to the front light pole of the range, and a trapezoidal shaped slatted target, 4 feet wide at the top, 6 feet wide at the bottom, and $6\frac{1}{2}$ feet high, has been attached to the rear pole.

The two lights in line 305° lead in to the anchorage in Magpie bay. Magpie Bay range lights are intended to indicate the anchorage in Rambler cove, and enable vessels entering the cove to avoid two rocks, awash at high water, which lie some distance offshore eastward of Magpie point.

The anchorage for Rambler cove—that is, for Magpie village—is between Magpie point and these rocks.

Rocks.—A rock, with 3 fathoms water on it, is reported to lie about 179° , 1 mile from Magpie river entrance, but its existence is doubtful.

Rather more than $\frac{3}{4}$ mile westward of Magpie river, and nearly $\frac{1}{4}$ mile offshore on the western side of Magpie bay, there is a rocky shoal, on which the sea almost always breaks at low water.

Communication.—A vessel of the North Shore Steamship line leaves Quebec about every 10 days during the season and calls at Magpie.

Telegraph.—There is a telegraph office at Magpie.

The coast between Magpie and Trout rivers, trending nearly westward, a distance of about 58 miles, is composed of primary rock rising immediately from the sea in steep, although often rounded, hills, which are either bare or partly wooded with small trees of the pine species. The hills nearest the gulf are about 200 to 300 feet in height, but at some $2\frac{1}{2}$ miles inland is a range rising 500 to 700 feet above the sea.

The appearance of this coast from seaward is slightly undulating, bold, unbroken, and of such similarity that it is very difficult to make out one part of it from another when the observer is at a distance of about 6 miles or more; but upon a nearer approach, the mouths of the rivers and the features of the land can generally be seen, and the position of a vessel thereby be at least approximately fixed.

This whole coast from the Mingan islands westward is very different from that to the eastward, being very much less broken and much less fringed with islands and rocks: also less barren.

Caution.—This coast is not so bold as it appears from a distance, for there are many rocks off it both above and under water, several of which are nearly 1 mile from the shore.

Unless bound to a place on this coast, between Magpie and Bouleau rivers, strangers should not approach it nearer than the depth of 20 fathoms; and between Bouleau river and St. Charles point nearer than 40 fathoms, for that depth in several places is within 1 mile of the rocks.

Local magnetic disturbance.—Black oxide of iron, besides being a constituent mineral in the granite rocks of this coast, is found abundantly in nests and veins, particularly in the vicinity of Shel-drake river. Its magnetic action on the needle of a compass on shore is such as to cause the variation obtained by it to vary from 14° to 29° west. In boats, while sounding, a similar disturbing influence on the compass has been sensibly felt, but diminishing or increasing as the water deepened or shoaled. In the Gulnare, at about 2 miles

from the shore, or within the 50-fathom line, the error from this cause never exceeded 6 degrees, and at the distance of about 5 miles it became insensible.

Ridge point lies 261° , $3\frac{1}{2}$ miles from Magpie point.

Four-fathoms ridge, a narrow ridge of rocky ground with 4 to 6 fathoms over it at low water, extends $4\frac{1}{2}$ miles westward from Ridge point across a rocky bay, in which there are one large and several small rocks above water. The western end of this rocky ground is nearly 1 mile southward of Thunder point. A very heavy sea rises upon the ridge at times, and it then becomes dangerous to large vessels. There is a depth of 20 fathoms water close outside it in some parts, and of 30 fathoms near its western end.

Cod bank.—From about 2 miles westward of Ridge point a bank of sand, gravel, and broken shells extends southwestward 11 miles; the depths on it are 34 to 41 fathoms with 52 to 63 fathoms around; cod-fish abound on this bank.

At about 6 miles farther in the same direction is a bank about 3 miles long north and south and 1 mile wide, with 49 fathoms, mud, on it, and 52 to 69 fathoms around.

Sheldrake point lies 263° , $9\frac{3}{4}$ miles from Ridge point.

Communication.—A vessel of the North Shore Steamship line leaves Quebec about every 10 days during the season and calls at Thunder river and at Sheldrake.

Telegraph.—There are telegraph offices at Thunder river, 6 miles westward of Ridge point, and at Sheldrake.

Sheldrake (Sawbill) river flows into the bay between Sheldrake point and Ore point, which bears 274° , $3\frac{1}{2}$ miles from the former; it may be distinguished by the clay cliffs immediately within the entrance, and the peculiar hills on either side of it, which are barren and of gray feldspar, thickly studded with small round mounds.

This river affords shelter to boats and small coasting craft, but, in consequence of the heavy surf, it can be entered only in very fine weather. It has scarcely any bar, but the entrance at the western extremity of a long and narrow spit of sand, which extends across the mouth of the river, is very narrow, with depths of 4 to 11 feet in it, according to the time of the tide, at ordinary springs; at high water neaps there is seldom more than 9 feet. This depth continues but a very short distance within the entrance.

Shallop river, $6\frac{1}{4}$ miles westward of Ore point, affords shelter only to boats, and can be entered only when there is no surf. Off this river and also off Sandy river, a small stream about $2\frac{1}{2}$ miles farther westward, there are several rocks, both above and under water. The outer of these rocks lies fully $\frac{1}{2}$ mile from the shore.

Communication.—The North Shore steamer calls at Shallop.

Manitou river, the entrance of which is 274° about 2 miles from that of Sandy river, is the largest on this coast, excepting the St. John and Moisie rivers, and it may be distinguished by two remarkable patches of clay cliff, one of which is close eastward, and the other about 1 mile westward of its entrance, and both of which are visible from many miles seaward.

Directions.—To enter the river, keep close along the rocky western side of Manitou point, the eastern entrance point, leaving on the port hand the sandy spit close within the point, which spit stretches out from the sandy western entrance point. The channel does not shift its position, but is more or less deep and wide according to the season and the recent winds. Generally the channel is about 60 yards wide, with a depth of 5 feet in it at low water, or 9 feet at high water neaps, and 12 feet at high water springs. Strong southerly and westerly winds cause a heavy surf, and render the entrance impracticable. A short distance within the entrance there are 9 feet at low water, deepening gradually to 5 fathoms at the first rapid, 1 mile up the river. Farther up, $\frac{1}{2}$ mile, the river falls in one unbroken sheet of water, 120 feet perpendicularly, over sienite and porphyry, and forms a most beautiful cascade.

Water may be taken from a small stream on the western shore, a short distance within the entrance; or from up the river where the water is fresh.

Anchorage.—There is good anchorage off Manitou river in fine weather with the wind offshore in 15 fathoms, mud, with the entrance of the river bearing 23° , $1\frac{1}{2}$ miles.

Small vessels anchor farther inshore westward of the bar and in the bay between Manitou point and Buchan point, which bears 274° , 3 miles from the former. The soundings decrease regularly in toward the land, with sand and clay bottom, but there is a small rocky shoal at 257° , $2\frac{1}{4}$ miles from the entrance of the river and about $\frac{3}{4}$ mile offshore, with a depth of 7 fathoms within it and 9 fathoms close outside it.

Buchan, Tortue (Fall), and Hotteurs rivers fall in cascades into the sea, or close to it, between Buchan point and Bouleau river entrance, and thus form good marks from seaward; there is, besides, a remarkable white patch close westward of Buchan river.

Bouleau (Bason) river, the entrance of which is 264° , 8 miles from Buchan point and 10 miles westward of Manitou river, has a spit of large stones extending about 300 yards off its eastern entrance point. The entrance is very narrow, with a varying depth, which is less or more according to the prevalence or infrequency of

southwesterly winds; but there is generally enough water for very small coasting craft or large boats. There are rapids $\frac{1}{4}$ mile within the entrance.

Cape Cormorant, $1\frac{1}{4}$ miles westward of Bouleau river, is a small peninsula, on the inner side of which are the log huts of a trading post always occupied, but which are scarcely noticeable from seaward.

Blaskowitz point lies $5\frac{3}{4}$ miles westward of cape Cormorant, and between them are Cormorant islets, joined to the mainland at low water, and not readily distinguishable from it.

Cormorant reef, off Cormorant islets, at 248° , $2\frac{3}{4}$ miles from cape Cormorant, and about 1 mile from the mainland, is small, with a least depth of 12 feet over it. From the inner edge of the reef Blaskowitz and St. Charles points are in line, bearing 266° , so that St. Charles point well open of Blaskowitz point leads southward of the reef.

The coast between cape Cormorant and St. Charles point, lying 264° , $10\frac{1}{2}$ miles, is fringed with rocks above and below water and is broken into coves, two of which are nearly 1 mile deep, full of rocks, and afford shelter only to boats.

St. Charles point has a large cove on its eastern side, and on its western side the land trends west-northwestward toward Trout river.

St. Charles reef, lying off St. Charles point, is so bold that there is no warning by the hand lead, and very little by the deep sea lead. It is composed of numerous rocks near each other, with a considerable depth of water between them; some of the rocks are always above water. The outer patches, which are always covered, lie rather more than $\frac{3}{4}$ mile south-southwestward of St. Charles point, and the reef continues to the first cove at $1\frac{1}{2}$ miles northwestward of the point, but does not there extend so far offshore.

Caution.—When beating westward vessels should take care not to be becalmed westward of St. Charles reef, lest the heavy southwesterly swell, which is frequent on this coast, should set toward the reef, where the water is too deep to anchor until close to the breakers.

Moisie (Moisic) bay is situated between St. Charles point and Moisie point, which lies 248° , 11 miles. Trout river, a small stream, falls into the head of this bay. The shore of the bay, which trends west-northwestward $6\frac{1}{2}$ miles from St. Charles point to Trout river entrance, is rocky, whence a bold sandy beach extends south-southwestward to Moisie river.

The soundings are regular in the bay, with deep water, over clay and sand.

Seal House cove, on the east side of Moisie bay and $2\frac{1}{2}$ miles west-northwestward of St. Charles point, affords shelter only to boats.

On the cove are two log houses, which are occasionally occupied as a fishing and trading post.

Hills.—The granite hills on the northeastern side of Moisie bay leave the shore at Trout river and continue northwestward inland until they join the ridges in rear of Seven Islands bay. Between the hills and the sea there is an extensive tract of low sandy country, thickly wooded, which seems to have been formed, in the course of time, by the action of the rivers and the sea.

Moisie river flows into the sea on the eastern side of Moisie point, which is the southern extremity of the low sandy country. The river is larger than the St. John, and discharges a great quantity of water in the spring after the melting of the winter snows, and brings down from the interior great quantities of sand, which so obstructs its wide and shallow channel in the first $2\frac{1}{2}$ miles from the sea that boats can not ascend at low water.

The entrance of the river is about 600 yards wide, with a least depth of 9 feet. Immediately within the entrance the river becomes shallow, expanding into a space $2\frac{1}{2}$ miles wide and full of sand bars at low water; thence the breadth of the river decreases to $\frac{1}{2}$ mile at $2\frac{1}{2}$ miles above the entrance, where the sand bars cease. The river has then a clear channel, with a depth of 9 feet water, between steep sandy banks or cliffs for 1 mile farther, where its breadth is $\frac{1}{4}$ mile. The river has not been examined above this point, where the current is rapid in spring. The traders state that flat bottomed boats can ascend to the first rapids, at the distance, by the stream, of 20 miles from the sea. The bar, which is of sand and dry at half tide, extends nearly $\frac{1}{2}$ mile west-southwestward from the long, low, and narrow eastern entrance point, and nearly parallel to the eastern side of the western entrance (Moisie) point, which is a peninsula.

The entrance channel of the river, between this bar and the western point, has a north-northeasterly direction, and continues for the distance of 1,200 yards with a breadth of $\frac{1}{4}$ mile and a depth varying with the seasons and the prevailing winds; southerly and easterly winds having a tendency to block up the channel. It is supposed that there is seldom a less depth than 9 feet at low water under the western entrance point, which is the only place where a small vessel can find shelter, close to two log houses occasionally employed as a salmon fishery by the Hudson Bay company. But the shelter afforded here is very imperfect during southerly and easterly gales, which send in so heavy a sea that after breaking completely over the bar and across the entrance it still causes danger to vessels.

Tides.—It is high water, full and change, at the entrance of Moisie river, at 1h. 30m.; springs rise 5 to 8 feet.

Population.—There were 171 residents at Moisie river in 1901.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Moisie about every 10 days during the season.

Telegraph.—There is a telegraph office at Moisie river.

Moisie shoal.—Although the bar of Moisie river is so bold that there are 50 fathoms water at the distance of $\frac{3}{4}$ mile southward and southeastward of it, yet the shallow water continues from it $3\frac{1}{4}$ miles to the west-southwestward, past Moisie point, forming an extensive triangular sandy shoal, with $1\frac{1}{2}$ to 3 fathoms on it at low water.

Moisie rock, near the southern part of Moisie shoal, 232° , $2\frac{1}{2}$ miles from Moisie point, and 1.6 miles from shore, has 3 feet water over it. This is an extremely dangerous rock, the 3-fathoms line passing about 300 yards southward of the rock, and immediately seaward of this line the water deepens to 25 fathoms. The rock can generally be seen, in fine weather, from the change in the color of the water and from the breakers on it when the sea is heavy.

There is no close leading mark for avoiding this shoal, but the northern point of Manowin island, in line with the southern point of Great Boule island 261° , leads 1 mile southward of the edge of the shoal, and in over 30 fathoms water.

Boule bay is situated between Moisie shoal and Sandy point 281° , about $8\frac{1}{2}$ miles.

East rocks, which are low, bare of trees, and always above water, lie in Boule bay about 268° , $6\frac{1}{2}$ miles from Moisie point, and they are out of the way of sailing vessels, which should not stand into this embayed place, since there is generally a heavy southerly swell rolling in, which would render it difficult to beat out.

Seven islands are high and steep, composed of primary rocks, very thinly wooded, and can be made out from a distance of 20 miles, being unlike any other islands in the gulf. The islands are six in number, but the peninsula forming the western entrance point of Seven Islands bay appears as an island from a distance seaward, being 737 feet high, and higher than any of the islands. East and West rocks are in the group.

Little Boule island, 1.7 miles westward of East rocks, and about the same distance southward of the mainland, is nearly circular in shape, and a little more than $\frac{3}{4}$ mile across.

Great Boule island, 300 yards southward of Little Boule, is about 2.2 miles long, north-northeast and south-southwest, 600 yards to 1 mile wide, and 695 feet high. The narrow passage between Great and Little Boule islands is deep, but the tidal streams in it are strong, the flood setting west-southwestward and the ebb east-northeastward, and the passage is subject to sudden and baffling flaws of wind.

Great Basque island, separated from Sandy point by East channel, and 1.7 miles west-southwestward of Little Boule island, is 1.9 miles long, north-northwest and south-southeast, nearly 1 mile wide, and 500 feet high.

Little Basque island, $\frac{1}{4}$ mile southward of Great Basque island, is 1.2 miles long, north-northwest and south-southeast, $\frac{1}{2}$ mile broad at its northern end, and tapers to a point at its southern end.

The passage between Great and Little Basque islands has several rocks above water in it, and it is shoal; the tidal streams are strong.

Manowin and Carousel islands lie west-southwestward of Little Basque island, and together extend 2.4 miles northwest and southeast, with a width of about 800 yards; the islands are separated by a channel 6 feet deep and a few yards wide. Manowin, the northern island, is 457 feet high; Carousel, the southern, is much lower.

Light.—A square lighthouse, 39 feet high, with dwelling attached, and painted white with one red horizontal band, on Carousel island, exhibits, at 190 feet above high water, a fixed white light, which should be seen in clear weather a distance of 20 miles.

Fog signal.—A diaphone trumpet operated by compressed air in a rectangular white building with a red roof, sounds, during thick or foggy weather, 1 blast of 5 seconds duration every 90 seconds: Thus, blast 5 seconds, silent interval 85 seconds.

The trumpet is elevated 184 feet above high water and projects from the southern gable of the building in a 142° direction.

West rocks, between Manowin island and the peninsula which forms the western entrance point of Seven Islands bay, are small and low.

Caution.—The narrow pass between Manowin island and West rocks is rendered intricate by rocks which nearly cover at high water, and dangerous by the tidal streams which set strongly toward and through it; the flood westward, and the ebb eastward.

Seven Islands bay is $2\frac{3}{4}$ miles wide at the entrance between Sandy point and point Chassé, which bears 246° ; the bay thence extends about 6 miles northward and westward, with a deep water space about 3 miles wide, and nearly landlocked, being completely sheltered from seaward by Seven islands. The bottom is of clay, and there are no shoals, excepting the mud banks, which fill up the northern part of the bay.

A fine, broad, bold, sandy beach extends 3 miles northwestward from Sandy point to the entrance of the principal river, near which is the Hudson Bay Company's trading post. The houses at this post can not be seen from the outer parts of the bay, but there is a wooden store on the beach.

About 4 miles and 8 miles north-northwestward of the bay there are two parallel ranges of mountains running east-northeastward and west-southwestward; the summits of the nearer range are upward of 1,300, and those of the more distant upward of 1,700 feet above the sea. These mountains, the high peninsula, the bold and hilly islands, and the other features around the bay, form a scene of great beauty. They also render the position of the bay conspicuous.

Anchorage.—The best anchorage berth in Seven Islands bay for a vessel of large draft is in 9 fathoms, clay bottom, with Sandy point and the northern side of Little Boule island in line 109° , and point Chassé in line with the western side of West rocks 189° . From this position the northern end of the sandy beach near the entrance of the river bears 0° ; the sandy beach to the eastward is distant nearly 1 mile, and the 3 fathoms edge of the shoals, which occupy the northern part of the bay, is distant $\frac{3}{4}$ mile. Smaller vessels anchor in 6 fathoms about 600 yards nearer the wooden store, which is as near as any vessel should anchor.

In this anchorage the swell with a strong southerly wind is considerable, but not enough to endanger a vessel, although sufficient to prevent boats from landing. The anchorage, in 13 fathoms, soft clay, in the southwestern part of the bay, is smooth and quite landlocked.

Clark city is a new (1904) settlement on the western shore of the bay. Extensive pulp and saw mills have been constructed on St. Margaret river, about 9 miles inland, and a railway has been built from the mills to a point called point Noire, on the western side of Seven Islands bay, where there is a wharf, which is 1,100 feet long, with a depth of 26 feet at low water at its outer end.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Seven islands about every 10 days during the season.

Telegraph.—There is a telegraph office at Seven Islands bay.

Water can be obtained at high tide from the river which flows past the Hudson Bay Company's post.

Seven Islands bay approach.—**East channel**, between Great Basque island and Sandy point, is 1,100 yards wide, but there is a rock in its middle, covered only at high tides, from which a reef, with 6 to 9 feet water over it, extends eastward $\frac{1}{4}$ mile. The passage on either side of the reef is 400 yards wide and has deep water.

Middle channel, between Basque islands on the east and Carousel, Manowin, West rocks, and the peninsula forming the western entrance point of Seven Islands bay on the west, is the best channel, being $1\frac{3}{4}$ miles wide, and clear of dangers, and deep to within 100 yards off the shore, excepting at point Chassé, where a reef extends 250 yards from the shore. This channel is preferable for sailing vessels in all

winds except northerly and northwesterly, with which, to prevent beating against them, it might be desirable to enter by West channel.

West channel, between West rocks and point Croix, the southern end of the peninsula, is $\frac{3}{4}$ mile wide, clear of dangers, and deep. However, three rocks lie 200 yards northward of West rocks, but they always show, except in very high tides and the smoothest sea. Therefore, West rocks should not be approached nearer than 400 yards; the peninsula side of the channel is bold.

Caution is necessary here during the ebb or east-going stream, which, being turned off by point Croix, sets toward West rocks.

Directions.—East channel is approached from between Boule islands and East rocks, or from between Boule and Basque islands, both routes being clear of dangers and deep; the islands are so bold that any part of them may be approached to the distance of 200 yards.

In going through East channel, which in a sailing vessel should not be attempted without a fair wind, keep 200 yards either from Great Basque island, or from Sandy point; the latter is preferable.

In Middle and West channels simply give the shore a berth of 400 yards in every part.

The water is too deep for anchoring in the channels, and the bottom is generally rock, except to the eastward and northward of Boule islands. The ground is not fit for anchoring until well into Seven Islands bay. The water is very deep outside these islands, which are so bold that they may be approached closely.

Tides.—It is high water, full and change, in Seven Islands bay, at 1h. 40m.; springs rise 9 feet, neaps 5 feet.

The rate of the tidal streams in the bay, and in the principal channels among Seven islands, seldom reaches 1 knot, but in the narrow channels between Boule islands, Basque islands, and in East and West channels, it reaches 2 knots at springs, or even more in the narrowest of these channels when accelerated by strong winds. The flood setting westward, strikes Boule islands, and passes around and between them and Basque islands. That portion which passes southward of Great Boule island turns toward Carousel island and West channel; the greater part of the stream, which passes within Boule islands, enters Seven Islands bay by East channel. There is very little flood stream in Middle channel, excepting an eddy setting outward or southwestward close along the southeastern coast of the peninsula, and the narrow stream from between Basque islands, which sets across toward West channel.

The ebb stream sets fairly out of Seven Islands bay, part of it by East channel and part of it by Middle channel, where it meets the east-going stream through West channel, which turns it to the eastward, past and southward of Basque and Boule islands.

Winds.—In fine nights the wind is almost always light and baffling among Seven islands, particularly if it is westerly in the offing. At such times there is generally a northerly land wind in Seven Islands bay, but it seldom reaches far out among the islands in the early part of the night, although it often does toward the morning.

The coast between point Croix and point de Monts, which bears 217° , distant 62 miles, is of very moderate height, the country near the sea being formed of small and low granitic hills, partly wooded with spruce trees. Marshes and ponds are frequent between the hills; sandy beaches occur occasionally, and the sandy tracts in rear of them are always the most densely wooded parts. The higher hills are, generally, far inland. The coast between the points mentioned forms a large bight about 9 miles deep in its largest part; and in this bight are several smaller bights or bays.

There are no detached dangers off this coast, which is much bolder than its appearance indicates; and although the water is deep off every point of it, yet, with few exceptions, deep sea soundings give warning of approach to the land. (See local magnetic disturbance, p. 38.)

St. Margaret bay.—St. Margaret point bears 245° , $12\frac{1}{2}$ miles from point Croix, and St. Margaret bay, lying between, is clear of shoals. The water shoals gradually in the bay outside St. Margaret River bar, with sand bottom, from 18 fathoms at 1 mile from the 3 fathoms line of soundings. There is a sandy beach for a considerable distance on either side of the mouth of the river.

St. Margaret river flows into St. Margaret bay nearly in the middle of its head at 6 miles from point Croix, and, although a large stream, it affords shelter only to boats. A bar of sand extends $\frac{3}{4}$ mile seaward from the entrance, and has several small channels through it, only 3 feet deep. Immediately within the entrance, which is 350 yards wide, the water is 6 feet deep, but only 3 feet can be carried up to the low falls, which are over granite rocks, $3\frac{1}{4}$ miles above the entrance. Below the falls the river flows between cliffs of sand and clay and is full of sand bars, dry at low water.

Telegraph station.—There is a telegraph office at St. Margaret river.

St. Margaret point is rocky, of moderate height, and has a round hill a short distance back from it. Several rocks, which cover at high water, extend nearly $\frac{1}{3}$ mile off this point. These rocks are very bold, and at $1\frac{1}{2}$ miles outside of them there is no bottom at 70 fathoms.

The coast between St. Margaret point and Great Cawee island, which bears 219° , distant $15\frac{1}{2}$ miles, is low, and fringed with small islets and rocks close to the shore, which may with caution be closely

approached by the lead, but the depth of 20 fathoms is near enough to it in ordinary navigation. Rock river and many other small streams discharge into the bay which lies between the point and the island. Off this coast the deep sea soundings are very irregular; in some parts there is a depth of 50 fathoms at 4 to 5 miles offshore; in others, as off May islets, $5\frac{1}{2}$ miles north-northeastward of Great Cawee island, there is no bottom at 60 fathoms within 2 miles of the rocks.

Cawee islands are two hilly gray granite islands, nearly bare of trees. Great Cawee island, the larger and higher, is triangular in shape, each side being about $\frac{3}{4}$ mile long, and about 250 feet high. Little Cawee island, lying $1\frac{1}{4}$ miles farther southwestward, is nearly 600 yards long, northeast and southwest, and 200 yards wide; there are several rocks above water close off it to the southwest, and a reef extends nearly 400 yards northwestward of its western part.

An islet, about 200 yards across, lies about 200 yards northeastward of this island.

Water.—There is neither wood nor water in Cawee islands, but both can be obtained from the mainland.

Cawee rock, 205° , 600 yards from the southern point of Great Cawee island, is small, round, high, and so bold that a large ship might lie alongside of it.

Great Cawee cove, on the northern side of Great Cawee island, is secure for boats, and has plenty of deep water, but its entrance is too narrow for vessels. There is a small island at its entrance.

Great Cawee shoal, 500 yards north-northeastward of the mouth of the cove, has a depth of 15 feet water over it. From the shoal, the northern end of the island, situated at the entrance of the cove, is in line with the point of the mainland to the westward.

Cawee ledge, 11° , $\frac{1}{2}$ mile from Great Cawee shoal and 600 yards off the mainland, is small, round, and awash at low water. From the ledge the southern side of Large rocks is in line with the point of the main to the westward, and the southern side of Little Cawee island is just shut in by the northern side of Great Cawee island.

Rock.—A small rock above water lies 328° , 600 yards from Great Cawee shoal and about 300 yards off the mainland.

Large rocks, 400 yards west-northwestward from the island at the entrance of Great Cawee cove, and 300 yards from the mainland, are two large rocks close together; a reef extends southwestward 400 yards from their southwestern point.

Anchorage.—There is anchorage in the mouth of the bay on the inner or northwestern side of Great Cawee island, in 7 fathoms, mud bottom, at 200 yards from the island. It is completely sheltered with winds from west-southwest, through west and north, to northeast,

and tolerably so with all easterly winds, although some swell rolls around the island, but southwesterly winds blow right in. and send in a very heavy sea.

Directions.—For this anchorage from the eastward steer 289° , $\frac{1}{2}$ mile northeastward of Great Cawee island, to avoid Great Cawee shoal, until the point of the mainland to the westward is midway between the northern side of the island at the entrance of Great Cawee cove and Large rocks. Keep this range on until between Large rocks and the island, when haul into the mouth of the small bay on the northwestern side of Great Cawee island, and anchor in 7 fathoms. There are about 12 fathoms in the middle of the channel, and upward of 9 fathoms can be carried through, but the depths are irregular.

From the westward pass between Little Cawee island and the main by keeping in mid-channel; but it is better to run between Little and Great Cawee islands, hauling close around the western point of the latter into the anchorage. This route is clear, excepting for Cawee rock, which is always visible.

Caution.—This is a very dangerous and intricate place, and the anchorage between Great Cawee island and the main is too small for large vessels, being only 400 yards wide. It may, however, be used as an occasional place of shelter for small vessels, and even as a place of refuge for a large vessel in distress, for the ground is so good that a vessel well moored there might ride out a summer gale.

Tides.—It is high water, full and change, at Cawee islands at 1h. 50m.; springs rise 9 feet, neaps 5 feet. The tidal streams run fair through between the islands and the mainland, the flood setting southward, and the ebb northeastward, at a rate which seldom exceeds $1\frac{1}{2}$ knots, and which is generally much less.

Sproule point of the mainland lies west-northwestward $\frac{3}{4}$ mile from Little Cawee island. Reefs extend off it 200 yards toward Little Cawee island, and 800 yards south-southwestward.

Lobster bay is between Sproule point and Crooked islands, which are a group of small islets and rocks extending $\frac{3}{4}$ mile from the shore at 3 miles southwestward of Sproule point, and are bold to the southward and eastward. Shallow water extends about 800 yards off the northwestern side of the bay, and its northern part or head is occupied by an extensive flat of sand and bowlders, dry at low water, on which lobsters abound. The bay is an excellent open roadstead, with plenty of room for large vessels.

There is anchorage in the bay midway between the reef off Sproule point and Crooked islands, in from 12 fathoms to 5 fathoms, according as the distance is $1\frac{1}{2}$ miles or 1 mile from the 3 fathoms edge of the flats in the head of the bay. The bottom is fine sand over clay, and the bay is sheltered, except from winds between east-northeast,

through east and south to south-southwest, which blow right in, with a heavy sea and thick weather.

Pentecôte (Pentecost) river flows into the sea on the southwestern side of a rocky point situated $1\frac{1}{2}$ miles southwestward of Crooked islands; the southwestern entrance point is sand. Alluvial hill, 2 miles south-southwestward of the mouth of the river, is a remarkable, round and wooded hill. The first reach of the river is toward this hill, leaving a very narrow sandy ridge between it and the sea. Steep cliffs of sand and clay form the banks of the river for $2\frac{1}{2}$ miles, to which distance only it is navigable for boats. The entrance of the river is 30 yards wide, with a depth of 7 feet, and the river has 9 feet within for a short distance; at high water 12 to 16 feet can be carried in, so that this river is capable of affording shelter to coasting craft as well as boats; but it is very difficult to take a sailing vessel in through the narrow entrance, and it is impossible during the ebb stream, which is very rapid.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Pentecôte about every 10 days during the season.

Telegraph.—There is a telegraph office at Pentecôte river.

The coast.—A fine, bold, sandy beach extends about southward 7 miles from Pentecôte river entrance to English point.

English point.—A shoal of large stones extends 600 yards off English point, and on the southwestern side the shoal may be approached to the depth of 6 fathoms at low water, but on the southeastern and eastern sides it is very bold, there being 15 fathoms at the distance of 600 yards and 30 fathoms at $\frac{3}{4}$ mile from the 3 fathoms line of soundings.

The land at about $1\frac{1}{2}$ miles behind English point and thence south-southwestward for about 5 miles is high.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at English point about every 10 days during the season.

Telegraph.—There is a telegraph station at English point.

Egg island, about 188° , 2.2 miles from English point, is about $\frac{3}{4}$ mile long, nearly north and south, narrow, low, and composed of granite rocks, without trees. The southern end and western side of the island are bold.

North reef, the southern end of which is 349° , 800 yards from Egg island, is 600 yards long, nearly north and south, narrow and low, but always above water; it is black and is bold toward the mainland and also toward English point, from which its northern end is distant $1\frac{1}{2}$ miles. A reef under water extends southward $\frac{1}{4}$ mile from these rocks, leaving a very narrow 3-fathom channel between them and Egg island.

Northeast reef extends 1,200 yards from the northeastern point of Egg island and is the greatest danger between Seven islands and point de Monts. Some of its rocks show at low tides, and the sea generally breaks on them at low water. This reef breaks the swell rolling in between North reef and Egg island, and is thus a shelter to the anchorage.

Light.—An octagonal lighthouse, built over the keepers' dwelling (the whole being 48 feet high), and painted white with one red vertical stripe, is situated at about 200 yards from the southern end of Egg island, and exhibits, at 74 feet above high water, a revolving white light, which attains its greatest brilliancy every 90 seconds. and should be seen, in clear weather, a distance of 15 miles.

Anchorage.—Egg island, with its rocks and reefs, forms a natural breakwater, 1.3 miles long, which inclines slightly toward the coast at its northern end so as, with the shoal off English point, to shelter the anchorage from easterly winds. The northern end of North reef, the northern part of the breakwater, is distant from the mainland nearly $\frac{3}{4}$ mile, and the southern end of Egg island, the southern part of the breakwater, more than 1 mile; but large flats extend from the mainland and diminish the navigable breadth of the channel to about 600 yards in the narrowest point, which is abreast the reef of the mainland southwestward of North reef and nearly opposite the northern end of Egg island. The best anchorage is south-southwestward of this narrow part, where the breadth, from the 3 fathoms edge of the shoal off the main to Egg island, is 1,200 yards.

Along the inner sides of Egg island and of North reef, except near their northern ends, the water is deep, from 7 to 20 fathoms, the soundings decreasing gradually toward the mainland. The best depth to anchor in is about 9 fathoms; the bottom is clay in the deep water toward the island, and sand from the depth of 9 fathoms toward the mainland. There is little danger of dragging an anchor uphill toward the main; but with violent squalls off the land, a good scope of cable out is necessary, for should the anchor start a vessel might drift on the rocks before she could be brought up.

It is advisable, in order to have as much room as possible with a moderate depth of water, not to anchor northward of a line joining the middle of Egg island and Roadstead point, which is a rounded point of the mainland bearing 290° from it. The best position is with the southern end of Egg island bearing 121° and the inner side of North reef 20° . This position is sheltered from north-northeast through north to south-southwest by the mainland, and from east-southeast to north-northeast by the island, with its rocks and reefs. Winds from between south-southwest and east-southeast are seldom

strong, and even with them some shelter may perhaps be found by shifting berth to the eastward, where there is 7 fathoms, sand.

The anchorage at Egg island is too small to be a resort for large vessels, but as a place of refuge it might be of value, especially as the greater part of the coast is destitute of harbors.

Directions.—From the southward and westward round the southern end of Egg island, and haul into the anchorage. To run north-northeastward through between the island and the main, stand in to the northward until English point is open an angle of 6° to the northward of North reef, then steer for English point, giving the western side of North reef a berth of 200 yards, until $\frac{1}{4}$ mile northeastward of the reef. Then haul eastward out to sea.

Do not approach Northeast reef, for there are 20 fathoms at the distance of $\frac{1}{4}$ mile from it in every seaward direction, and consequently little warning by the lead.

Tides.—It is high water, full and change, at Egg island at 2h. 0m.; springs rise 11 feet, neaps 6 feet.

The rate of the tidal streams between Egg island and the main is $\frac{1}{2}$ to 1 knot, the flood setting south-southwestward and the ebb north-northeastward. A part of the ebb stream sets toward and out through the narrow 3 fathoms channel between the island and North reef, and a part of the flood comes in through the same channel.

Water.—There is no water on Egg island, but it can be taken from small streams on either side of Roadstead point.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Egg island about every 10 days during the season.

The coast.—Calumet river is a small stream flowing into the sea at 231° , $2\frac{1}{2}$ miles from Egg island. Along the coast for 1 mile south-southwestward of its entrance there are reefs of large stones extending out 1,200 yards from high-water mark, with a depth of 15 fathoms at $\frac{1}{2}$ mile seaward of them. South-southwestward of these rocks, as far as Trinity bay, the coast is clear, with 20 fathoms at $\frac{1}{2}$ to 1 mile and 40 fathoms at 2 to 3 miles from it, and may be approached with safety if due caution is used.

Caribou point, $6\frac{1}{2}$ miles from Calumet river entrance, is a small rocky peninsula, with sandy coves on either side of its isthmus, in which boats sometimes shelter.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Caribou point about every 10 days during the season.

Telegraph.—There is a telegraph station at Caribou point.

Trinity bay, about 208° , $5\frac{1}{2}$ miles from Caribou point, is 2 miles wide and nearly 1 mile deep, with a fine sandy beach extending from Trinity river, which flows into the bay about $\frac{3}{4}$ mile westward of the northeastern entrance point, to the southern entrance point of the bay. This point is rocky, and off the northeastern entrance point are two low black rocks. The depth of water between the entrance points is from 5 to 7 fathoms at low water, over sandy bottom.

Anchorage.—This bay affords excellent anchorage in a moderate depth of water, with good ground and plenty of room to weigh in any wind. It is a valuable place in westerly winds, for sailing vessels bound up the St. Lawrence, to await an opportunity of proceeding round point de Monts and up the estuary.

Trinity river is a small and rapid stream, abounding with trout and salmon, from which water can be procured only at high water, because of the large stones about its entrance.

Directions.—In approaching Trinity bay, either from the northeastward or southwestward, do not close the land to less than the depth of 15 fathoms until the bay opens; then haul in and anchor in 7 fathoms at low water, with Point de Monts lighthouse (seen just within a small rock about $1\frac{1}{2}$ miles southwestward of the bay) bearing 215° , the outer of the two rocks off the northeastern point of the bay 15° , and the entrance of the river 325° ; this position is rather more than $\frac{3}{4}$ mile distant from the southwestern point of the bay. Vessels of heavy draft may anchor farther out and in deeper water, and small craft in 3 fathoms, close under the southwestern point.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Trinity bay about every 10 days during the season.

Telegraph.—There are telegraph offices at Trinity bay East and Trinity bay West, $2\frac{1}{4}$ miles apart.

Point de Monts lighthouse, close to the sea, southwestward 5 miles from Trinity bay, and northeastward about $1\frac{1}{4}$ miles from point de Monts, is circular, 90 feet high, and painted white with two red horizontal bands; it exhibits, at 93 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 15 miles. The light is obscured when bearing southward of 70° by higher land, and from northeastward of Caribou point the light is not visible southward of 209° .

Fog signal.—During thick and foggy weather an explosive fog signal, giving one report, is fired every 15 minutes from a position near Point de Monts lighthouse; if a vessel's under way fog signal is heard in dangerous proximity, an additional signal is fired and

repeated every 5 minutes while the vessel's fog signal continues to be heard.

Marine signal and telegraph station.—There is a signal and telegraph station at this lighthouse.

Caution.—Vessels eastward of point de Monts at night, when the land can not be seen, should tack when the light bears 224° , but if between Trinity bay and the light, 235° is near enough. Vessels may, however, approach closer, using due caution, by the lead. Vessels westward of the light should tack as soon as it bears 60° .

The bearing on which the light disappears leads only 1 mile from the bar off Godbout river.

Rocks.—A ledge of rocks with 9 feet least water lies 201° from the lighthouse, 111° from the point, and $\frac{1}{2}$ mile offshore.

A rock with 2 fathoms on it lies 179° , $\frac{1}{2}$ mile from the lighthouse; and a rock with a little more water lies 88° , $\frac{1}{2}$ mile from the lighthouse. These rocks must be guarded against when making the light in thick weather, or when keeping close to the land with a northerly wind; and the depth of 15 fathoms is quite near enough to approach them at any time, this depth being not more than 400 yards distant from the first, and about twice that distance from the two last of these rocks.

Tides.—It is high water, full and change, at point de Monts at 0h. 0m.; springs rise 12 feet, neaps 6 feet.

Population.—In 1901 there were 529 residents in the neighborhood of point de Monts.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at point de Monts about every 10 days during the season.

CHAPTER X.

PROVINCE OF QUEBEC—LOWER ST. LAWRENCE RIVER, NORTH SHORE—POINT DE MONTS TO SAGUENAY RIVER, AND THE SAGUENAY RIVER.

VARIATION IN 1908.

Point de Monts-----	24° 15' W.	|	Port Neuf-----	21° 56' W.
Bersimis point-----	22° 41' W.	|	Saguenay river-----	21° 10' W.

Lower St. Lawrence—North shore.—The land, which on the eastern side of point de Monts is rather low, begins to rise immediately westward of that point, and granite hills, very sparingly wooded, and not above 1,000 feet in height, form the north shore of the estuary as far as St. Giles point, westward $30\frac{1}{2}$ miles from point de Monts. This shore is bold, there being little or no warning by the lead; nor is there any good anchorage sufficiently roomy for occasional use by shipping.

St. Augustine cove, $1\frac{1}{2}$ miles westward of point de Monts, affords shelter only to boats.

Godbout (Goodbout) river, $8\frac{1}{2}$ miles westward from point de Monts, flows into the sea at the extremity of a sandy point, and has a bar of sand, which extends nearly $\frac{1}{2}$ mile from the eastern entrance point, dries in great part at low water, and is bold to seaward. There is usually at low water not more than 4 to 5 feet over this bar, on which a heavy surf very frequently breaks; and the river is of use only to boats because of the difficult and narrow entrance, although there are 15 to 16 feet of water over the bar at high water springs. At this river there is a trading and salmon fishing post of the Hudson Bay company, the houses of which are visible from seaward.

Tides.—It is high water, full and change, at Godbout river at 1h. 52m.; springs rise 11 feet, neaps 6 feet.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Godbout river about every 10 days during the season.

Telegraph.—There is a telegraph office at Godbout river.

Anchorage.—There are anchorages on either side of the bar of Godbout river, but they are too near the shore to be of general use.

The anchorage about midway between the bar and the first rocky point westward of it, at or about 1 mile westward of the bar, may occasionally be useful to small vessels in easterly winds.

At this anchorage, which is safe only in summer, the bottom is of coarse sand; the tidal streams are weak and irregular, rendering it difficult to keep the anchor clear in calm weather; they also frequently set toward the shore, coming in with long ripplings parallel to it.

Directions.—For this anchorage observe that the first rocky point westward of the bar and the eastern entrance point of St. Nicholas harbor in line, bearing 273° , just clears the bar; therefore keep the eastern entrance point of St. Nicholas harbor open until the houses at Godbout river bear 20° , when the bar will have been passed. Then bring and keep the points in line, anchoring when the eastern end of the high clay and wooded banks on the western side of the river, where it turns inland, and which can be seen over the sandy beach, bears 10° . The houses at Godbout river then bear 60° , cape St. Nicholas 257° , and the outer extreme of the bar 88° , and the depth is 6 to 7 fathoms at low water. Toward the shore the depth is $3\frac{1}{2}$ fathoms at the distance of 100 yards and then 3 fathoms for nearly 400 yards farther in, whence the water is shoal to the beach, distant about $\frac{3}{4}$ mile from the anchorage. To seaward the water deepens rapidly to 30 fathoms at the distance of 600 yards.

St. Nicholas harbor lies westward 7 miles from Godbout bar, and is a narrow inlet between granite hills 500 to 700 feet in height, extending northwestward 1.3 miles; it is so secure that a vessel might be placed on shore and repaired; and on the southwestern side a vessel can lie alongside the rocks. There is a depth of $9\frac{1}{2}$ fathoms in the deepest part of the harbor, sandy bottom.

The breadth of the harbor inside is 380 yards, and at the entrance is only 150 yards. The shoals on the eastern side of the entrance dry out so far as to leave a channel between them and Cross point, the western entrance point of the harbor, only 60 yards wide, with a depth of 5 feet at low water springs.

The depth that can be carried in at high water is 12 feet at neaps, and 17 feet at springs. The bottom in the entrance is sand, with some few large stones upon it, which can be seen and avoided if the tide be not high enough to pass over them. The entrance is in the middle of a small bay, $\frac{3}{4}$ mile wide and rather more than $\frac{1}{4}$ mile deep to Cross point, which projects into the bay and is rocky, with a small wooden cross upon it, whence it takes its name. An extensive shoal of sand and boulders, which dries at half tide, extends southwestward nearly 700 yards from the eastern point of the bay and continues northward to the harbor entrance. This shoal, which is quite bold, can always be seen, and it completely shuts out the sea from the harbor in southerly and easterly winds. The shoals on the western side extend 800

yards across a small bay westward of Cross point and also 200 yards offshore.

The anchorage between these shoals, in the bay off the mouth of the harbor, is only 600 yards wide and is therefore too small to be of any use to large vessels, but the ground is good, and the depth convenient for anchoring those vessels that can enter, preparatory to warping into the harbor.

The stones on the bar of this harbor might be removed, and it has been ascertained, by boring, that the channel could be deepened to any desirable extent.

Directions—Caution.—A southeasterly wind blows into St. Nicholas harbor, and is consequently the most favorable wind for running in, but if such a wind is strong at high water, when the shoals are covered, there is generally some sea outside the narrow entrance; an accident then might be serious, and therefore it is only in very fine weather that the entrance should be attempted with the wind from this direction.

A northwesterly wind blows right out of the harbor, and often with great violence. A southwesterly wind is the safest for entering, for the entrance and bay outside are then quite smooth; this wind will seldom take a vessel completely in, but it usually enables her to shoot so far within Cross point that a line may be sent ashore, or a kedge sent ahead, to warp into the harbor, and preparations for doing this should be made well beforehand.

Entrance should be made in the last quarter flood; then if the ground is touched no damage is caused, and there is time to warp in before the tide begins to fall.

To enter St. Nicholas harbor from off the mouth of the bay, bring Cross point to bear 358° , then steer so as to leave it between 50 yards and 30 yards distant on the port hand. If the wind permits, run in, at the same distance from the western shore, until the water deepens: but should the wind fail, or there be light baffling flaws out of the harbor, as often happens during westerly winds, send a line to the western shore, or anchor underfoot as soon as the way is lost, and warp into deep water.

The shoal water, which may be called the bar, and commences at Cross point, continues 400 yards within it, and the channel is rendered narrow, by shoals off the eastern shore, for a similar distance farther up the harbor. To have as much room as possible, anchor farther in than Three rocks, which are large and on the eastern side of the harbor.

To go to sea, wait for a northwesterly wind; or take advantage of the land wind in the early morning, which often occurs in fine weather when westerly winds prevail; or warp out in a light breeze or calm to a position from which sail can be made.

Tides.—It is high water, full and change, in St. Nicholas harbor at 1h. 55m.; springs rise 12 feet, neaps 7 feet.

Water.—There are several small streams on the eastern side of St. Nicholas harbor where water can be taken; it can also be taken, at high water, from the two small rivers at the head of the harbor.

Cape St. Nicholas, 216° , $2\frac{3}{4}$ miles from Cross point, is a high, bare granite point.

St. Pancras cove, westward 9 miles from cape St. Nicholas, being only about 320 yards wide, between steep rocks, and open to the southward, with very deep water, is of no use to ships. There is a depth of 32 fathoms in its entrance, whence it shoals gradually to 17 fathoms at $\frac{1}{4}$ mile from its head. The sea is never heavy in the cove, and it affords shelter to boats.

There is a smaller cove westward of the western entrance point of St. Pancras cove, whence the land, which is high and rocky, trends about southwestward 2 miles to St. Pancras point.

Comeau rock, situated about 1,000 yards southward of the eastern entrance point of St. Pancras cove, is a circular rocky patch, about 50 yards across, with a least depth of 10 feet over it.

English bay, between St. Pancras point and St. Giles point, which bears 222° , distant $3\frac{3}{4}$ miles from it, is not a good anchorage, as the water in it is deep; a heavy sea rolls into the bay in easterly winds, and its shores are high and rocky. Anchorage might be obtained close to its western shore in 17 fathoms at low water, and a vessel here would be well sheltered from all but easterly winds, but the position is very dangerous, for should a strong wind from that quarter set in it would not be possible to weather the eastern side of Manikuagan shoal during the flood stream.

Buoys.—There are buoys for local use in English bay.

Manikuagan (Manicouagan) river.—St. Giles point, the northern entrance point of Manikuagan river, is high and rocky, like the shore of the St. Lawrence, to the eastward of it. Manikuagan point, the southern entrance point of the river, and the northeastern end of which bears 217° , 3.3 miles from St. Giles point, is low and thickly wooded, with a broad sandy beach, like the shore of the river southwestward to Outarde bay. This complete change in the character of the land indicates to a vessel her approach toward the dangerous Manikuagan shoal.

Manikuagan river flows through narrow channels between shoals that dry at low water, and over a bar which extends from St. Giles point to the northeastern end of Manikuagan shoal, into Manikuagan bay. The shallow channels between the shoals unite in the inner entrance of the river at 6 miles westward of St. Giles point,

where the river is narrow and about 4 fathoms deep. The falls, where the river discharges a great body of water down a narrow and sloping channel between steep granite rocks, are 3 miles farther up northwestward, and a boat can approach close to them.

Buoys.—There are buoys for local use in Manikuagan river.

Anchorage.—The principal channel into the river is on the northern side of its entrance, and Manikuagan hole, a deep place in the channel, close to St. Giles point, and extending $1\frac{1}{4}$ miles within it, is $1\frac{3}{4}$ miles long, about 800 yards wide, with a depth 3 to 5 fathoms, mud bottom. Although this place appears completely open to easterly winds, no swell of consequence rolls into it, and a vessel well moored on its northern side within St. Giles point would probably be in safety. To get there it is necessary to pass over the bar which extends 2 miles eastward from St. Giles point; this bar has 7 feet over it at low water springs. The seaward side of the bar is extremely bold, there being 30 fathoms, sand bottom, close to it, and 50 fathoms, mud bottom, at the distance of 1 mile. The bar then sweeps round till it joins Manikuagan shoal, which is dry at low water for nearly 5 miles. 52° , from the northern end of Manikuagan point.

Directions.—This is altogether too wild and dangerous a place to be of general use for navigation.

If entering the river from necessity, while seaward of the bar bring St. Giles point to bear 236° and steer directly for it, and when the head of English bay bears 337° the bar is close-to. Proceed over the bar with St. Giles point on the same bearing, 236° , until the points on the western side of English bay bear 354° ; then steer about 213° along the southeastern edge of the shoal, which dries at low water off St. Giles point, until the point on the northern side of the river, at about $5\frac{1}{2}$ miles westward of St. Giles point, opens southward of St. Giles point, when steer to pass St. Giles point at the distance of 200 yards and anchor $\frac{1}{2}$ mile within it, in 3 to 4 fathoms at low water. (See Local magnetic disturbance, p. 38.)

Tides and tidal streams.—It is high water, full and change, at Manikuagan river entrance at 2h. 15m.; springs rise 12 feet, neaps 7 feet. The ebb stream, setting eastward, runs out over Manikuagan bar at the rate of about $1\frac{1}{2}$ knots, and the flood, setting westward, is nearly as strong.

Population.—There were 128 residents at Manikuagan in 1891.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Manikuagan about every 10 days during the season.

Manikuagan point is the eastern end of Manikuagan peninsula, and it extends northward and southward $3\frac{1}{2}$ miles with a curve to

the eastward; the point is low and thickly wooded, with a broad sandy beach.

The coast of the peninsula westward to Outarde point, a distance of 12 miles, is low sandy cliffs, with a sandy beach.

Marine signal and telegraph station.—There is a telegraph and signal station at point Paradis, on the southern side of Manikuagan point.

Manikuagan shoal is of sand, with many large boulders over its eastern and southern parts, probably deposited there by the ice. The eastern point of this extensive shoal is 2.3 miles, 88° , from St. Giles point, and 55° from the northeastern end of Manikuagan point.

St. Pancras cove bearing 10° leads along the eastern side of the shoal, which is so bold that there are 60 fathoms of water at the distance of little more than $1\frac{1}{4}$ miles, and 40 fathoms at half that distance from the breakers: this side of the shoal dries nearly out to its edge at low tides. The southern point of the shoal extends $2\frac{1}{2}$ miles southward of the southern end of Manikuagan point, and here only is there any sufficient warning by the deep sea lead; with the southern end of Manikuagan point bearing between 337° and 303° there is a depth of 60 fathoms, very fine sand bottom, at $3\frac{1}{2}$ miles from the 3-fathom line, toward which the water shoals gradually, till close to it, where there are 17 fathoms. The shoal dries out at low tides in this part, and also farther westward, from 1 to $1\frac{1}{2}$ miles from the beach.

The shoal continues from its southern point 16 miles southwestward, the outline of its edge corresponding to the shape of the sandy coast of the peninsula as far as Outarde point, off which it extends $1\frac{1}{2}$ mile southward, and, filling up all the eastern part of Outarde bay, stretches out its western part southwestward fully $3\frac{1}{2}$ miles from Outarde point. This western part of the shoal is the Outarde shoal.

Whistling buoy.—A conical red whistling buoy is moored in 34 fathoms about $\frac{3}{4}$ mile from the edge of Manikuagan shoal, with the southern end of Manikuagan point bearing 323° , distant $3\frac{1}{4}$ miles.

Telegraph.—There is a telegraph office at Outarde point.

Tidal streams.—The tidal streams are tolerably regular and not very strong along Manikuagan shoal, the rate of either stream not exceeding 2 knots at any time, and being usually much less. There is often a heavy sea, particularly in a windward tide, off the shoal, and great rippings are very common off its eastern and southern parts, where they have been observed to move faster than the tidal streams; they often give to the streams an appearance of a rapidity which does not exist.

Outarde river flows southwestward into Outarde bay northward of Outarde point. This river can be ascended by boats to the falls,

which are over granite rocks, and are 7 miles above the point. These falls are only $1\frac{3}{4}$ miles from Manikuagan river, and the two rivers therefore form the low, sandy country between Outarde and Manikuagan points into a great peninsula.

Outarde river is entered by several intricate and narrow channels through Outarde shoal in which, for the distance of about 4 miles, there are only 2 to 3 feet of water at low tide.

The water of this river holds a white earth in suspension, and frequently covers the whole of Outarde bay, floating on the heavier sea water, and giving the bay the appearance of being shoal. A vessel passing through this superstratum of fresh water displaces it, and leaves a blue streak in her wake.

Outarde bay lies between Outarde point and Bersimis point, which bears 217° , $9\frac{1}{4}$ miles from it, and the bay has in it three small rocky islands which appear as two from seaward and serve to indicate the position of the bay; they are far within the edge of the shoal, which extends quite round the bay.

Anchorage.—Good anchorage can be obtained in Outarde bay, in 14 fathoms, mud, with Bersimis point bearing 190° , $3\frac{1}{4}$ miles, and Manikuagan point 64° ; this position is nearly $\frac{1}{2}$ mile from the 3 fathoms edge of the shoal on the western side of the bay.

There is also anchorage for a distance of $\frac{3}{4}$ mile on either side of this position, either toward Bersimis point, or toward the small islands to the northeastward, but the above berth is the best. Small vessels may lie closer to the shoal to the westward in 6 fathoms. This anchorage is excellent in westerly gales, and may occasionally be very useful to vessels bound up the St. Lawrence.

Directions.—Approaching this anchorage from the westward, beware of Bersimis River bar, which is extremely steep. The rocky point situated 0° , 5 miles from Bersimis point, bearing 336° or westward of that, leads eastward of Bersimis River bar. After passing the bar haul in to the northward for the anchorage, but do not reduce the depth to less than 10 fathoms.

Tidal streams.—The rate of the ebb tidal stream seldom exceeds 2 knots, and that of the flood is much less. The direction of these streams in the western part of Outarde bay is reversed by the effect of Outarde river, so that the flood sets north-northwestward and north-northeastward, and the ebb south-southwestward and east-southeastward.

Bersimis river flows east-southeastward and enters the sea on the northern side of Bersimis point, which for $\frac{3}{4}$ mile from its extreme is low and bare sand. The northern entrance point of the river is also sand, and it bears 314° , 1 mile from Bersimis point, but the wide mouth of the river between the two points is closed by sands dry

at low water, with the exception of a very narrow channel. The river for 3 miles within the entrance is wide and full of sand shoals.

Range light-beacons.—Two white masts, each surmounted by a white diamond, are erected on the beach within the northern entrance point of Bersimis river. The masts are 360 feet apart, the outer one being 20 feet and the inner one 30 feet high. Each mast exhibits a fixed white light, which is visible through a small arc on both sides of their line of bearing, and should be seen in clear weather a distance of 5 miles. The outer light is 30 feet and the inner 40 feet above high water. The beacons, or their lights, in line, bearing 297° , lead in 4 feet at low water over the bar. The masts are capable of being moved to suit the frequent changes in the position of the channel.

The bar is of sand, which dries in parts at low water and shifts frequently, being completely open to southerly and easterly gales; it extends nearly $1\frac{1}{4}$ miles eastward of Bersimis point. Within the bar the channel is always close to Bersimis point, and keeps on that (southern) side inward through the wide part, with a depth of 9 feet at low water.

Bersimis river is difficult to enter, but small vessels used to be taken in by local pilots.

This river discharges a great volume of water, especially in spring, and the water at 2 miles within its entrance is fresh enough at the last of the ebb for drinking. The river is navigable to the falls, which are 30 to 40 feet high, and over granite rocks, and are nearly 40 miles distant from the entrance, by the course of the river. The banks of the river are high and precipitous, being either granite or cliffs of sand and gravel over clay. The basins and valleys between the hills are filled with the last-named deposits, which support a thick growth of trees of the pine and spruce species; and good timber is to be met with occasionally. The breadth of the river varies from 200 to 600 yards, and its depth is usually 2 to 5 fathoms; there is one place in which the depth amounts to 12 fathoms, but a depth of 2 fathoms is as much as could be carried up the foot of the falls.

At 6 miles up the river the channel is contracted by shoals of sand and bowlders to the breadth of 100 yards for a distance of 1 mile. Through this narrow part the rate of the ebb stream is 4 knots; above it, the rate is 1 to $2\frac{1}{2}$ knots. Boats could row up this river to the foot of the falls, and a steamer could ascend it with ease, but the winds are generally too light and baffling between its high banks for a sailing vessel.

Tides.—It is high water, full and change, at Bersimis river at 2h. 0m.; springs rise 12 feet, neaps 7 feet. The flood tidal stream is felt 10 miles up the river.

Telegraph.—There is a telegraph station at Bersimis.

Bersimis point is low sand and difficult to be seen at night; at 2 miles from the point the land becomes wooded with spruce trees. Southward of the point the sand shoal extends $\frac{3}{4}$ mile from the sandy beach, yet it is so bold that the lead affords no warning, there being 60 fathoms mud bottom, at 1 mile from the edge of the shoal. The whole shoal around the point is equally steep, so that caution is required in this vicinity, especially by vessels beating at night or in foggy weather.

The shore from the southern extreme of Bersimis Point peninsula trends approximately southwestward 17 miles to Laval island, and thence southward 13 miles to Mille Vaches point. In all this distance, if the extreme points be excepted, the soundings afford some warning of approach to the shore, but in places great caution is necessary.

Tidal streams.—The tidal streams are regular, but the flood is rather stronger than the ebb within 6 miles of the shore, where the rate of either stream seldom exceeds $1\frac{1}{2}$ knots, and is often much less.

Jeremy island.—The shore from Bersimis point is low and sandy for $5\frac{1}{2}$ miles southwestward to Jeremy island, which is very small, rocky, and close to the mainland, where there is a trading post of the Hudson Bay company. The buildings of this trading post can usually be seen, but if not, its position is indicated by some patches of white sand and clay cliffs, close eastward of the island. Vessels may stand in and anchor off this place by the lead, but the anchorage is bad, and shoal water extends 1 mile from the shore.

Cape Colombier.—A rocky and broken shore trends from Jeremy island southwestward 5 miles to cape Colombier, which is a rocky peninsula, with a small islet on its western side.

Gulnare shoal is a narrow ridge of granite rock about 2 miles long, parallel to the coast, with depths of 2 to 3 fathoms over it at low water. The southwestern end of this shoal bears 169° and its northeastern end 96° from the eastern point of cape Colombier, from which both ends of the shoal are distant $1\frac{3}{4}$ miles. The northern end of Laval island, nearly in line with point Orient, which lies 234° , $5\frac{1}{2}$ miles from cape Colombier, bearing 252° , leads 400 yards southward of this shoal in 20 fathoms water. There is a depth of 23 fathoms close to the southwestern end of the shoal, and also along its southern side, while there are 3 to 5 fathoms between it and the shore.

Plongeur bay, which lies between cape Colombier and Wildfowl reef, may be known by a round and rocky peninsula on its western side. The inner part of the bay is full of rocks dry at low water, and the whole bay is shoal.

Wildfowl reef, the outer part of which is southwest 4 miles from cape Colombier, is a large bed of rocks extending $\frac{3}{4}$ mile from the shore between Plongeur bay and point Orient. There are 9 fathoms water at 600 yards outside this reef.

Caution is necessary when standing toward the shore from Gularé shoal to Wildfowl reef, inclusive; the depth of 30 fathoms is quite near enough. But southwestward of the reef, until within 2 miles of Portneuf, vessels may, with safety, stand in to 6 fathoms at low water.

Laval bay is situated within Laval island at 4 miles westward of Wildfowl reef, and 13° , $8\frac{1}{2}$ miles from Portneuf. The bay may be recognized by Laval island, which is rocky.

Laval bay is all dry at low water, but vessels may safely stand in toward it, the water shoaling gradually from 10 fathoms at $2\frac{1}{2}$ miles from the shore. There is good anchorage in 6 fathoms, clay bottom, off the clay cliffs southwestward of the bay.

The shore.—Clay cliffs commence at $1\frac{1}{2}$ miles southwestward of Laval bay and continue for nearly $5\frac{1}{2}$ miles, whence a low, narrow, and sandy peninsula, having on it a clump of pine trees, and forming the eastern side of Portneuf river entrance, extends southward 2 miles.

Light.—A square lighthouse, 38 feet high, painted white with two red vertical stripes, near the end of the peninsula, exhibits, at 40 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 11 miles.

Marine signal station.—There is a signal and telegraph station at this lighthouse.

Portneuf river entrance runs northward between the sandy peninsula above mentioned and the mainland, but it is nearly dry at low water. Within the junction of the peninsula with the sand and clay cliffs the river turns abruptly westward and inland; below that turn its sandy channel is too shallow for a boat at low water, and at $1\frac{1}{2}$ miles above it rapids commence. At high water neaps 7 feet, and at high water springs 12 feet of water may be carried in between the peninsula and the mainland, and a small vessel may lie safely aground on the sand. (See Local magnetic disturbance, p. 38.)

Tides.—It is high water, full and change, at Portneuf, on the western shore, at $\frac{1}{2}$ a mile within the entrance, at 2h. 10m.; springs rise 14 feet, neaps $8\frac{1}{2}$ feet.

Portneuf is situated on the western shore of the river entrance 321° , $\frac{3}{4}$ mile from the end of the peninsula; at this port there is an establishment belonging to the Hudson Bay company, who have a

lease of the seigniory of Portneuf. This post and salmon fishery stands upon a steep sandy bank, and contains a small wooden church for the Indians, a dwelling house, a store, and several smaller buildings, which are visible from seaward.

Portneuf sands.—The eastern patch of these shoals, with $3\frac{3}{4}$ fathoms least water, lies about 57° , $1\frac{3}{4}$ miles from the southern end of the sand and clay cliffs at the northern end of the peninsula. The sands extend nearly 1 mile eastward of the peninsula, whence they continue southwestward; at about 2 miles from the end of the peninsula their edge is $1\frac{3}{4}$ miles from the beach, and it then turns to a position about 1 mile southeastward of Mille Vaches point. The sands are steep between the bearings 68° from Portneuf, and 158° from Mille Vaches point, where there are 20 to 30 fathoms close along their edge, and 40 to 50 fathoms at the distance of 1 mile.

Mille Vaches point, 216° , 4 miles from Portneuf lighthouse, is low, sandy, and wooded with spruce trees. Between this point and Bicquette island the shoals on either side of the river are so bold and the set of the tidal streams and currents so uncertain that great caution is necessary when running up in foggy weather.

Mille Vaches bay lies between Mille Vaches point and Esquamine islets, which bear 217° , distant $11\frac{1}{4}$ miles from the point; and several small rivers descend by falls or rapids down the granite shores into the bay. The principal of these rivers is Mille Vaches (Saut de Mouton), 254° , $4\frac{1}{4}$ miles from Mille Vaches point; this river has a fall of 80 feet, visible from seaward when abreast of it.

All the interior of this bay is occupied by shoals of sand, mud, and large bowlders, which dry at low water. In the western part of the bay the shoals are steep, but in the space of $4\frac{1}{2}$ miles, comprised between Mille Vaches point bearing 338° and Mille Vaches river bearing 338° , there is good warning by the lead, the depth being 30 fathoms at 2 to 3 miles from the 3 fathoms edge of the shoals.

Anchorage.—There is anchorage in Mille Vaches bay in 15 fathoms, sand and mud bottom, with Mille Vaches point in line with the inner or northern side of the pine trees on the peninsula of Portneuf, bearing 34° , about 3 miles from the point, and $\frac{3}{4}$ mile from the shoals, sheltered from southwest, through north, to north-northeast. The ground is good and there is not much tide.

Population.—There were about 1,150 inhabitants in the neighborhood of Mille Vaches bay in 1901.

Telegraph.—There is a telegraph office at Mille Vaches.

Esquamine islets (îles Escoumains) are two large rocks nearly 12 miles southwestward from Mille Vaches point, and have three small rocks nearly 1 mile southward of them.

The shore from these islets to Little Bergeron cove, 16 miles southwestward, consists of granite rock, steep and bold, and free from danger, excepting a flat which occupies the bay southwestward of cape Bon Désir, but which does not extend more than $\frac{1}{4}$ mile outside a line joining the points of the bay. Along this shore there are upward of 50 fathoms water close to the rocks.

Escoumains river is a considerable stream situated 5 miles southwestward of Esquamine islets. There are numerous boulders in the entrance, and these are being removed. A small bank with 7 fathoms water, on which vessels anchor to load wood, lies off the southern entrance point.

On the northern side of the entrance is a large settlement with a population of 490 in 1901, and containing a saw and pulp mill and a church.

Range lights.—At Escoumains two masts, 20 and 25 feet high, respectively, exhibit at 30 feet and 47 feet above high water fixed red lights that should be seen on the range line in clear weather a distance of 2 miles.

The front mast stands on the edge of the public road about 100 feet back from the shore, a short distance southward of the church, on ground 10 feet above high-water mark.

The rear mast stands 402 feet, 286° from the front mast, and the masts or their lights in line lead into Escoumains harbor clear of all dangers. But they can be used only by small craft with local knowledge.

Communication.—A vessel of the North Shore Steamship line from Quebec calls at Escoumains about every 10 days during the season.

Telegraph.—There is a telegraph office at Escoumains.

Bon Désir bay, about $4\frac{1}{2}$ miles southwestward of Escoumains river, is frequented by schooners to load cord wood and timber; the entrance of the bay is much obstructed by boulders.

Great and Little Bergeron coves are two small bays, separated by Bergeron point; both are full of large boulders, which dry at low water, and both have small streams flowing into their heads. Little Bergeron cove is the southwestern one, and it is 6 miles northeastward of Saguenay river entrance. In both these coves the boulders have been removed for some distance in the channels to the streams, and a landing pier with 8 feet water at its outer end is built at Great Bergeron.

Bergeron village contains a church, post-office, four sawmills, and two cheese factories.

Telegraph.—There is a telegraph office at Great Bergeron.

Tidal streams.—The tidal streams along this part of the coast are regular, with a rate increasing as the comparatively narrow pass on either side of Red islet is approached. The flood is the stronger stream, the ebb being deflected toward the southern shore by the stream out of Saguenay river. The flood does not extend more than 6 miles off the northern shore below Bergeron coves, and the closer to that shore the stronger is the stream; its rate off Mille Vaches point, where it does not extend far from shore, is $1\frac{1}{2}$ to 2 knots; and off Bergeron coves 2 to 3 knots, at springs.

SAGUENAY RIVER.

Saguenay river, which enters the St. Lawrence between point Vaches and Lark point, is a very remarkable and extraordinary river, inasmuch as it nearly resembles a long and narrow mountain loch for the first 50 miles above its confluence with the St. Lawrence.

In this distance the Saguenay is from 1,200 yards to 2 miles wide, filling up a deep transverse valley through mountains of sienitic granite and gneiss. These mountains rise everywhere more or less abruptly from the water, forming, in places, precipitous headlands over 1,000 feet in height, and, when seen one beyond the other up magnificent reaches of the river many miles in length, they produce scenery which, although wild and barren, is yet full of grandeur and beauty. The granite hills are generally quite bare, but the valleys, through which the rapid tributary streams descend, are filled with a deep deposit of sand and clay, and are thickly wooded. At Ha Ha bay and at Chicoutimi there are considerable tracts of good land, as there are also around lake St. John. This country now is becoming rapidly settled.

Within the part of the Saguenay where the mountains of the banks are highest the water is almost as deep as the mountains are high. Between the shoals at the entrance of the river there is a bar, on which there are 11 fathoms water; within the bar the depth increases to 20 and 80 fathoms, while above point Noire, for a distance of many miles, the depth reaches from 100 to 147 fathoms in the middle of the channel, and 100 fathoms on either side, often within less than the same number of feet of the precipitous shores. It is this great depth, the mountainous shores, and the impetuous stream that have rendered the Saguenay so celebrated, and that render its features so remarkable. The bed of the Saguenay, for many miles, is over 100 fathoms below that of the St. Lawrence at their point of junction; so that if the waters were to fall sufficiently to lay dry the bed of the latter river there would still remain a depth of more than 100 fathoms in the Saguenay.

There are anchorages occasionally, but they are some miles apart, and there are none, of course, in the great depths between them. In the case of a vessel becalmed, however, there is little or no danger, since there are no shoals in the channel when once within the entrance, and a boat ahead serves to keep her clear of the shore, while in a few places, perhaps, a line might be made fast to the rocks.

The Saguenay is navigable for large ships nearly to point Roches, 57 miles from the St. Lawrence; and small vessels (sailing vessels require the assistance of the flood stream) can ascend to Chicoutimi, 8 miles farther. Just above point Roches the river suddenly shoals, and there are only 7 feet water in its narrow and intricate channels, which lie between shoals composed of large boulders. Above this shallowest part, where at low water there is a complete rapid, the depth, between shoals of large stones, varies from 2 to 8 fathoms, and the river contracts to little more than $\frac{1}{4}$ mile in width, retaining that breadth nearly to Terres Rompues rapid at 6 miles above Chicoutimi.

The Saguenay discharges the water of lake St. John, contributing to the St. Lawrence a quantity of water inferior only to that which is supplied by the Ottawa.

Pilots.—The pilotage service on the Saguenay is under the control of the Canadian minister of marine and fisheries. The Saguenay is not within the port of Quebec. Special pilots stationed at Father point are employed for the Saguenay.

Communication.—There is daily steam communication during the summer from Quebec, the vessels calling at Tadoussac, Chicoutimi, Ha Ha bay, St. Jean bay, and again at Tadoussac in the order given.

Tides and tidal streams.—It is high water, full and change, at Tadoussac, at the entrance of the Saguenay, at 2h. 45m.; springs rise 17 feet, neaps 10 feet.

At Chicoutimi it is high water, full and change, at 4h. 11m.; springs rise 12 feet, neaps 8 feet.

Approximate height of the tide at every hour after low and high water ordinary springs:

Place.	Hours after low water.		Flood tide.		Hours after high water.		Ebb tide.	
	<i>h.</i>	<i>m.</i>	<i>Ft.</i>	<i>in.</i>	<i>h.</i>	<i>m.</i>	<i>Ft.</i>	<i>in.</i>
At Tadoussac	0	0	0	0	0	0	17	0
	1	0	1	3	1	0	15	0
	2	0	4	6	2	0	12	0
	3	0	8	0	3	0	8	0
	4	0	12	0	4	0	4	0
	5	0	15	6	5	0	1	0
	6	8	17	0	6	16	0	0

As the whole rise and fall at neaps is less than at springs, the proportionate part of the rise and fall for every hour is also less, and an allowance must be made accordingly.

At Tadoussac, the duration of the flood stream is 6h. 8m., and that of the ebb 6h. 15m.

The flood stream in the Saguenay is very weak, and above St. Marguerite river it is almost imperceptible, excepting a weak stream close to the shores. The water, however, has been observed at the depth of several fathoms to flow up, while on the surface it was stationary or descending. The tide flows to Terres Rompues rapid, about 6 miles above Chicoutimi, and 71 miles from the St. Lawrence. The rate of the ebb stream varies from 3 to 5 knots, according to the breadth of the river; it is strongest in the mouth of the river, where it sometimes runs at the rate of 7 knots, and sets strongly over Lark Islet reef and Point Vaches reef.

The meeting of the spring ebb streams down the Saguenay and the St. Lawrence causes breaking and whirling eddies and ripplings, so strong as to interfere with the steerage of a vessel, unless kept at a good speed. These streams, opposed to a heavy northeasterly gale, cause an exceedingly high, cross, and breaking sea, in which no boat could live, and which is even considered dangerous to small vessels. On the flood, at such times, there is not more sea near the Saguenay than in other parts of the St. Lawrence.

The following remarks on the currents in the Saguenay were made in a report to the Canadian government in 1875:

From St. Jean bay to point Roches, situated 36 miles to the north-westward, the surface stream is not strong at any time; in many parts there is a variable undercurrent, especially during springs, strong with the flood, but scarcely perceptible during the ebb. This undercurrent acting on sailing vessels drawing from 19 to 25 feet, sometimes renders them unmanageable even when assisted by a tug.

From point Roches to the entrance of Chicoutimi river the stream is steady and even, in some parts setting on to the shoals, but without any undercurrent.

At springs a large body of water passes over Chicoutimi shoals (at a very rapid rate during the ebb), and falling suddenly into deep water, seems to strike downward at once, leaving but a slight stream on the surface. The strong flood streams over the bar at the entrance of the Saguenay, falling suddenly into deep water may also contribute to a certain extent to checking the strength of the surface current of the river.

Tide tables for Tadoussac and Chicoutimi are published by the Canadian department of marine and fisheries, and by the U. S. Coast and Geodetic Survey.

Entrance of the Saguenay.—Lark point and point Vaches, Lark islet, the entrance points of the Saguenay, and the reefs off them, together with the leading marks and buoys for clearing them, as far

as required for navigating the St. Lawrence, also the anchorages of Moulin Baude and of Basque road, are described in pages 455–457.

The entrance channel between Prince shoal, Bar reef, and Lark Islet reef on the south, and Vaches patch and reef on the north, is $\frac{3}{4}$ mile wide, with deep water and very irregular soundings. The shallowest part is on the bar between Bar reef and Vaches patch, where there is a least depth of 11 fathoms; immediately within the bar the depth increases, and off point Rouge it exceeds 80 fathoms. The river is $\frac{3}{4}$ mile wide from point Ilot, the northwestern point of Tadoussac harbor, marked by a beacon, across to point Noire, which point has a curious white mark on its southern side.

Lights—Buoys.—For the light on Lark islet, lightvessel on Prince shoal, and buoys at the entrance of the Saguenay, see pages 455 and 456.

Range lights.—A square white tower with sloping sides, 27 feet high, near the eastern extreme of point Noire, exhibits at 60 feet above high water, a fixed white light, that should be seen, in clear weather, a distance of 13 miles.

A square white tower with sloping sides, 27 feet high, situated 279° , 519 yards from the preceding lighthouse, exhibits, at 131 feet above high water, a fixed white light, that should be seen in clear weather, a distance of 15 miles.

These lights in line, 279° , lead into Saguenay river between Vaches patch on the north and Prince shoal and Bar reef on the south, but vessels of heavy draft must keep the rear light slightly open northward of the front light, or the range a little open on the port bow, until past Bar reef.

St. Catherine bay is on the southern side of the entrance of the Saguenay, between Lark islet and point Noire, and it affords anchorage in 20 to 30 fathoms water, out of the strength of the streams, but exposed to considerable swell in easterly winds. On the northwestern side of this bay there are several large iron rings in the steep granite shore, which were probably used for mooring or heaving down vessels in the time of the French.

Tadoussac (Tadousac) harbor, on the northern side of the entrance of the Saguenay at 1 mile within point Vaches, is a bay lying between points Rouge and Ilot, with a sandy beach at its head, and is 1,200 yards wide and 800 yards deep. The anchorage is in 7 to 18 fathoms, clay bottom. Vessels must moor, with a heavy anchor, close inshore, for the gusts from the northwestward are violent at times, and should the anchor start there would be little chance of bringing up again before the vessel had dragged her anchor down hill into deep water; and, although the anchorage is out of the regular tidal streams, yet eddies often set into the bay, causing a vessel

to swing around several times in a tide, so that it is almost impossible to keep a clear anchor.

The harbor is completely sheltered by either land or reefs, excepting toward the southeastward, and there Red islet and the southern shore of the St. Lawrence beyond it, at no great distance, prevent any sea, of consequence even to a boat, from entering the harbor.

Tadoussac village is situated on a semicircular terrace of sand and clay at the head of the bay, which is backed by steep, high, and rugged hills of granite. It is the chief town of Saguenay county, and a watering place much frequented by tourists during summer. The village contains three churches (one of which is the oldest church in Canada, having been erected in 1747), four hotels and stores, a telegraph office, and many handsome villas. It was formerly the principal of those posts for trading with the Indians which were known as the King's Posts, were leased to the Hudson Bay company in 1829.^a

The village contained 511 inhabitants in 1901.

Supplies in small quantities may be obtained here.

Communication.—There is daily communication during summer, from June to October, with Quebec by steamer.

Telegraph.—There is a telegraph office at Tadoussac.

L'anse à l'Eau, the small cove next westward of Tadoussac, is the seat of a fish hatchery, and has a wharf on its northern shore where the steamers of the Richelieu and Ontario Navigation company lie. The telegraph cable that crosses the Saguenay is landed in this cove.

La Boule point is a high and round-backed hill, forming a steep headland, at 4 miles above Tadoussac, and is the extreme point seen on the northeastern side of the river.

Directions.—Winds from south-southwest, through south to north-northeast, enable sailing vessels to enter the Saguenay on the flood tide. Southwesterly winds, which prevail in summer, do not blow far up, and vessels are then becalmed under the mountainous shores; but northeasterly winds, or winds up the St. Lawrence, draw also up the Saguenay, and are the only winds which can be depended on for running a vessel up to the anchorages above Tadoussac. Northwesterly winds often blow down the river in furious squalls, especially in the fall of the year.

In a sailing vessel, approach the Saguenay entrance early on the flood with a breeze which can be depended on, and plenty of daylight

^a The French explored the Saguenay before the middle of the sixteenth century, and Tadoussac soon after became, and remained till the settlement of Canada, their principal post on the St. Lawrence for carrying on the fur trade with the Indians.

to reach Tadoussac anchorage. Be sure to remember that the ebb sets like a rapid over Lark islet and Point Vaches reefs, and that it is dangerous to be becalmed just within either of these dangers, because the water is so deep that it is difficult to anchor. If impossible to reach Tadoussac and it is toward nightfall, or if the tide or the wind be unfavorable, anchor as convenient off Moulin Baude or in Basque road, and await an opportunity for running in, unless the vessel has a pilot qualified to beat her in with safety.

On arriving near the entrance either from the southwestward or northeastward, bring Brandy Pots (see p. 441) open eastward of White islet, bearing 194° ; steer on that range and pass well eastward of Vaches patch with the rocky patches to the eastward of it, Prince shoal, and Lark reefs. When the rear range lighthouse at point Noire is slightly open northward of the front lighthouse, head for the range in that way and keep it so until past Bar reef, and then haul gradually into Tadoussac harbor. Or steer on the Brandy Pots—White Islet range, until point la Boule is just open southwestward of point Ilot, 283° , when haul in for that range and steer into the river, passing southward of Vaches patch and Point Vaches reef, observing that points Ilot and la Boule in line pass over the southwestern part of Point Vaches reef, and must be kept open to clear it; when as far in as point Rouge, haul into the harbor. If the range marks can not be distinguished, enter the river, passing $\frac{1}{2}$ to $\frac{3}{4}$ mile northward of Prince Shoal lightvessel, and about 600 yards southward of Vaches Patch buoy, whence steer to pass midway between Point Vaches reef and Lark Islet reef and on into the harbor. In mooring in the harbor let go the outer anchor in 16 fathoms and the inner one close to the low-water mark.

Grosse Roche, called *Sacré Cœur*, is situated on the left bank of the Saguenay at about 5 miles above point la Boule. It is an important settlement, and contains one church, post-office, telegraph office, several stores, and two cheese factories. A wharf is to be constructed here.

Light.—A lantern rising from the red roof of a square white dwelling, the whole 35 feet high, on the eastern bank of the Saguenay, about 1 mile above Grosse Roche, exhibits, at 36 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 6 miles. The light is visible up and down stream.

ANCHORAGES IN THE SAGUENAY.

Barque cove, rather more than 1 mile above Tadoussac and on the same side of the river, is 400 yards deep. One or two vessels can moor in it.

St. Étienne bay and river are $10\frac{1}{2}$ miles up the Saguenay, and on its southwestern shore. The bay is 1 mile wide, and forms a harbor where several vessels may ride in 10 to 30 fathoms water, clay bottom, along the edge of the bank, which dries out $\frac{1}{3}$ mile from the shore.

A small village, having a church with a spire, and a pier, is situated at the northwestern side of this bay, and there is a sawmill on the river at the southwestern part of the bay.

Telegraph.—St. Étienne is connected with the Canadian telegraph system.

St. Louis isle is 16 miles up the river, and there is excellent anchorage, either under its eastern end or between it and the southern shore, in 10 to 30 fathoms water, sand and mud bottom.

St. Barthelemi isle, 1 mile higher up and on the northern side of the river, lies close to the mouth of the Cacard river. One or two vessels might anchor northwestward of the isle in 6 to 20 fathoms water. The place is small.

St. Jean bay (anse St. Jean), on the southern shore and 22 miles up the Saguenay, is $1\frac{3}{4}$ miles wide and $1\frac{1}{2}$ miles deep; there is a small islet off its northwestern point. St. Jean river and several small streams enter at its head. Off these streams and along the edge of the bank, which dries out $\frac{1}{4}$ mile from the shore, there is good anchorage for several vessels in 8 to 40 fathoms water, mud bottom. On the southern side of this bay there is a small village that has a telegraph office, a church, and a pier 366 feet long, with $7\frac{1}{2}$ feet water at its outer end; on the western side of the bay there is a prominent waterfall.

Light.—A brown mast, 16 feet high, close to the freight shed at the outer end of the pier in St. Jean bay, exhibits, at 16 feet above high water, a fixed white light, that should be seen, in clear weather, a distance of 8 miles.

Éternité cove, on the southwestern side of the river and 6 miles above St. Jean bay, is $\frac{1}{2}$ mile wide, $1\frac{1}{4}$ miles deep, with a river of the same name flowing into its head. At the head of this cove, vessels lie securely and quite landlocked in 8 to 30 fathoms, mud bottom.

Cap l'Éternité is the southern entrance point, and cap à la Trinité the northern entrance point of Éternité cove. Cap à la Trinité resembles three steps when seen from up or down the river; on the lowest, and about 400 feet above high water, is an image of the Virgin, 32 feet high; and on the next above, about 700 feet above high water, is a cross; the highest step rises to the height of 1,500 feet above high water.

La Niche, a curious hole in the cliffs, is on the southwestern shore, about 2 miles northwestward of cap à la Trinité.

Descente des Femmes, on the northern shore $11\frac{1}{2}$ miles above cap à la Trinité, is a cove 700 yards long, with a depth of 20 fathoms at its entrance, decreasing to 5 fathoms near its head. Several vessels can moor securely in it.

Tableau is a new settlement here, and as the only communication is by water, a wharf 193 feet long and 25 feet wide is built; houses extend round this cove, and round those on either side of it.

The Saguenay turns suddenly northward 5 miles above this cove, between cape East and cape West, but the previous westerly direction of the river is continued for 6 miles beyond cape West to the head of Ha Ha bay or to a distance of 55 miles from the entrance of the river.

Light.—An open frame tower on the southern extremity of cape East opposite the entrance to Ha Ha bay, exhibits, at 36 feet above high water, a fixed white light that should be seen in clear weather a distance of 11 miles over an arc of 206° from 278° through north and east to 124° . The light is unwatched.

Ha Ha bay is 6 miles deep and $1\frac{1}{4}$ to $2\frac{3}{4}$ miles wide, the widest part being at its head, where four considerable streams fall into it. The best anchorage is in 7 to 30 fathoms, clay bottom, on either side of a small islet joined to the shore at low water in the southwestern corner of the bay. There is room for a considerable number of vessels, but the anchorage is rather open to easterly winds.

This bay is fairly well settled, and is cultivated from Fort point, the southeastern entrance point of the bay, westward and northward to the northern cove at the head. St. Alexis, a considerable village, containing a church with a spire, and a sawmill, is situated on the shores of La Grande baie, the southwestern arm; a pier is built here. St. Alphonse, which also has a church with a spire, is situated on the northwestern arm of the bay. There is a pier at St. Alphonse to which steamers moor.

In 1901 there were 507 residents at Bagotville and St. Alphonse.

Telegraph.—There is a telegraph office at each of these villages.

Light.—A brown mast rising from the freight shed at the outer end of the pier at St. Alphonse, exhibits, at 34 feet above high water, a fixed white light.

Petites isles, on the northern shore of the Saguenay at $4\frac{1}{2}$ miles above cape East, are three small rocky islets joined to the shore at low water. The bay to the eastward of them forms a small but secure anchorage with a depth of 6 to 17 fathoms, mud bottom.

The Saguenay, which is here nearly 2 miles wide, with a depth of 65 fathoms, is, at 2 miles to the westward, contracted to $\frac{3}{4}$ mile by a high, rocky point projecting from its northern shore; but expands

again nearly to the previous breadth in the next 3 miles, which is the distance from the rocky point to point Roches. On the northern side of the river, from the high, rocky point to within 1 mile of point Roches, there is good anchorage in depths up to 20 fathoms.

St. Fulgence, or l'anse au Foin, is a small village on the northern shore of the Saguenay about $8\frac{1}{2}$ miles below Chicoutimi and about 1 mile above the high, rocky point. It contains one Roman Catholic church, four stores, and two sawmills. There is a block, 60 feet long and 30 feet wide, sunk in 10 feet water at about 2,500 feet from high-water mark, to give shelter to the small craft employed loading steamers in the bay; there is a wharf at the village.

Telegraph.—There is a telegraph office here.

Point Roches is 57 miles from the river entrance, and here the navigation ends for shipping, but vessels of small draft proceed to Chicoutimi, 6 miles farther.

The 3-fathom line of soundings runs nearly north and south 1 mile eastward of point Roches, and between that line and the point the water is all shoal, forming flats.

Anchorage—Buoys.—A black and white checkered can buoy is moored in 5 fathoms on the eastern edge of the flats below point Roches.

A red spar buoy is moored in 7 fathoms at 93° , 550 yards from the checkered buoy, and about 300 feet from a rocky spit with 7 feet water on it and which shoals to 2 feet inshore.

These buoys indicate the best anchorage for deep draft vessels waiting cargo from Chicoutimi.

When coming to the anchorage, after passing the high rocky point, keep a moderate distance off the northern shore, and anchor in 11 to 14 fathoms water, with cape West open of the high rocky point, an angle of about 2° , and a hut, on a platform pier which has been built well out on the shoal off point Roches and is conspicuous, in line with a clearing on top of bluff, bearing 314° , where a vessel with a full cable out can swing clear of the two buoys.

There is a good anchorage for vessels of light draft from 400 to 800 yards, 281° from the spar buoy, or inside the checkered buoy.

Directions are unnecessary for ascending the Saguenay from Tadoussac to the above mentioned anchorages, as there is neither a rock nor a shoal in the fairway.

The Saguenay is still $1\frac{1}{4}$ miles wide at point Roches, but contracts rapidly above it, and assumes at the same time the usual character of a river, such as mud banks on either side dry at low water, shoals of large boulder stones, drift trees, etc. The water also is fresh at low water. Work is being prosecuted for improving the upper reaches of Saguenay (1908).

There is a least depth of 7 feet at low water in the channel from point Roches to Chicoutimi. Vessels at Chicoutimi lie off river Moulin.

Local knowledge is required to proceed above the anchorage below point Roches.

Lights.—Five sets of range lights indicate the channel to Chicoutimi, and there is a fixed red light at Chicoutimi pier that should be visible from all points of approach by water in clear weather a distance of 5 miles.

RANGE LIGHTS.

Poste St. Martin range.—The front light is a fixed white light exhibited from a square white tower 47 feet high, on the southern bank of the Saguenay at river St. Martin, 100 feet from the bank. The light is 47 feet above high water and is visible in clear weather a distance of 7 miles.

The back light is a fixed white light exhibited from a brown square skeleton tower, surmounted by an inclosed watchroom, and a square lantern painted white; the tower is 2,060 feet 288° from the front tower, and is 82 feet high. The light is 81 feet above high water and is visible in clear weather a distance of 7 miles.

The lights in line 288° lead through the middle of the deep water channel clear of the flats off Anse au Foin and the eastern extremity of the Batture aux Loups Marins to intersection with River Valin range.

River Valin range.—The front light is a fixed white light exhibited from a square white tower, 19 feet high, with diamond slatwork facing range line, on the northern bank of the Saguenay, eastward of the mouth of river Valin. The light is 18 feet above high water and is visible in clear weather a distance of 9 miles.

The back light is fixed white, exhibited from the top of a white-slatted framework with white shed, having a red roof, at the base of the framework, the whole being 35 feet high, and situated 315° , 710 feet from the front tower. The light is 35 feet above high water and is visible in clear weather a distance of 11 miles.

The lights in line 315° lead toward northern shore of the river to intersection with Savards range.

Savards range.—The front light is fixed white, exhibited from a square white tower 17 feet high, with diamond day mark facing line of range, situated on the northern bank of the Saguenay, east of the Caribou river. The light is 16 feet above high water and is visible in clear weather a distance of 8 miles.

The back light is fixed white, exhibited from a square white tower 31 feet high, with an irregular beacon attached, situated 292° , 490

feet from the front tower. The light is 39 feet above high water, and visible in clear weather a distance of 11 miles.

The lights in line 292° lead along the northern part of the channel to intersection with Caribou River range.

Caribou River range.—The front light is fixed white, exhibited from a square white tower, 17 feet high, with a beacon facing the line of range, and situated on the northern bank of the Saguenay, westward of the Caribou river, in an alder swamp. The light is 14 feet above high water, and visible in clear weather a distance of 3 miles.

The back light is fixed white, exhibited from a white lantern with red roof, on top of a red square skeleton tower, the whole 36 feet high, and situated 820 feet, 277° , from the front tower. The light is 40 feet above high water, and visible in clear weather a distance of 3 miles.

The lights in line 277° lead to the intersection with Rivière du Moulin range, opposite the mouth of the river Caribou.

Rivière du Moulin range.—The front light is fixed white, exhibited from a square white tower, 31 feet high, situated on the southern bank of the Saguenay, eastward of the mouth of the river du Moulin. The light is 32 feet above high water and is visible in clear weather a distance of 2 miles.

The back light is fixed white, exhibited from a square white tower 31 feet high and situated in the trees on hillside, 751 feet, 215° , from the front tower. The light is 79 feet above high water and visible in clear weather a distance of 2 miles.

The lights in line 215° lead up from their intersection with Caribou River range to the channel on the southern side of the Saguenay above Lachance river.

Buoys.—The channel between point Roches and Chicoutimi is marked by seven red and six black can buoys, which are to be used according to the regular buoyage system of Canada; red buoys to be left on starboard hand in entering, and black buoys on the port hand.

Tugs.—There are two first-class tugs of over 300 tons and a small one of 21 tons, at Chicoutimi.

Chicoutimi town is a large village at the head of navigation, containing a large cathedral with a spire, a marine hospital, in front of which is a large obelisk, a convent, a court house, a hotel, and many other buildings. There is a pier at which the Richelieu and Ontario Navigation company's steam vessels call two to six times a week during summer, from June to October, with passengers, mails, and freight. The Chicoutimi paper mills produce about 100,000 tons of wood pulp annually. The development of this and the lumber industry here has been remarkable.

In 1901 the population of the town was 3,826.

Telegraph.—There is a telegraph office at Chicoutimi.

Ste. Anne du Saguenay, a village of about 2,000 inhabitants, is situated opposite the town of Chicoutimi. The parish contains, besides the church and post-office, seven stores, four cheese factories, a limekiln, brickyard, a pottery, and a sawmill. Both sides of the river in the locality are cultivated, and there are many farmhouses in the fields.

There is a pier at the village 494 feet in length, with a depth of $7\frac{1}{2}$ feet at low water at its outer end. During the season of navigation a steamboat performs a regular ferry service every hour between Ste. Anne and Chicoutimi.

Telegraph.—There is a telegraph office at Ste. Anne.

Chicoutimi river falls into the Saguenay, to which it is the largest tributary, on its southwestern side at 1 mile above the town. A short distance within its entrance it falls 40 to 50 feet, through a narrow, rocky, and rugged channel.

Several of the early missionaries, whose tombstones may still be seen, were buried in the chapel that formerly stood on the left bank of Chicoutimi river, now the site of large sawmills.

The Saguenay from Terres Rompues rapid to lake St. John, a distance of some 30 miles, is said to be so full of heavy rapids as to be dangerous to canoes, therefore the more circuitous route up the Chicoutimi, through lake Kenogami, and down Metabetsuan river is preferred. At the mouth of this last named river, on the southern shore of lake St. John, stands a king's post, leased by the Hudson Bay company. The post was established first by the Jesuit missionaries in the 16th century, and traces of their cultivation still remain.

CHAPTER XI.

PROVINCE OF QUEBEC—LOWER ST. LAWRENCE RIVER, BOTH SHORES—GREEN ISLAND AND RED ISLET TO SOUTH TRAVERSE AND COUDRES ISLAND.

VARIATION IN 1908.

Red islet.....	21° 00' W.	North end of Coudres is-
South end of Hare island..	20° 48' W.	land..... 19° 48' W.

General remarks.—The estuary of the St. Lawrence has been considered to end and the river proper to begin at Green island, simply because the adoption of such a division, at a part where the navigable channel becomes divided, contracted, and difficult, as it does at Green island, conveniently separates the sailing directions into parts corresponding with that distinctive change in the nature of the navigation.

The preceding chapters are intended to enable the seaman, with the aid of the charts, to navigate his vessel into the Gulf and as high up the river as Green island. This chapter commences at what may be considered the first difficult pass in ascending the St. Lawrence; the difficulty arising, not only from the dangerous reefs off Green island, Red islet, and the Saguenay river, but also from the great velocity and the transverse directions of the tidal streams.

Some descriptions and directions have already been given about the passage on either side of Red islet and its reef, Green Island light and reef, and the anchorage under that reef; and those descriptions and directions should be read carefully in connection with this chapter. (See p. 323.)

The whole distance from Green Island lighthouse to Lower (South) Traverse lighthouse is 54 miles. For the first 30 miles of this distance the river is divided into two channels, North and South, by Red islet, White islet, and Hare island, with the reefs and banks attached to, or extending from, them. All of these dangers, lying in the same direction, form a narrow, but not continuous, ridge of graywacke and slate rocks, nearly in the middle of the river, while for the remainder of the 54 miles, from the southwestern end of Hare Island bank to the northeastern end of Middle ground of South Traverse, a distance of 24 miles, the river is clear of detached shoals.

It is true, however, that some 10 miles of this distance are occupied by English bank, upon which the least water is $5\frac{3}{4}$ fathoms, and most of the soundings are but a fathom or two less than those surrounding the bank.

In this chapter the islands mentioned above, with their reefs and banks and anchorages, will be first described and then the mainland on each side of the river, with the channels between the mainland and the dangers.

RED ISLET, WHITE ISLET, AND HARE ISLAND, WITH THE BANKS EXTENDING FROM THEM, AND ALSO ENGLISH BANK.

Red islet, bearing 281° , 1.5 miles from the lighthouse on the northern point of Green island, is small, low, and composed of shingle partly covered with grass and resting on slate rock.

Light.—A circular gray stone tower, 64 feet high, with a red lantern, and a white dwelling having a brown roof attached to the tower, on the middle of Red islet, exhibits, at 68 feet above high water, a group revolving white light, showing 3 flashes at intervals of 10 seconds between their points of greatest brilliancy, followed by an interval of 30 seconds, during the greater part of which the light is totally eclipsed, thus completing the revolution in 50 seconds; the light should be seen, in clear weather, a distance of 12 miles.

Red Islet bank.—Red islet is quite bold at its southwestern end, but a rocky bank or reef, nearly dry in some parts at low water, extends north-northeastward 2.8 miles from it with a width of $1\frac{1}{2}$ miles, within the 5-fathom line. There is good warning by the lead in approaching this bank from the northeastward, but caution is necessary when approaching from the northward and westward, because the water is deep and the ebb stream sets strongly upon it on that side. In fine summer weather, a vessel becalmed or bound up may safely anchor to await the flood stream, in 10 fathoms at low water, eastward and southeastward of this bank, where there is good ground, and the strength of the ebb is much broken by the bank. If necessary a vessel might also anchor in 10 fathoms at 400 yards southward of the islet, but the ebb stream runs there at the rate of $6\frac{1}{2}$ knots an hour.

Lightvessel.—A schooner, painted red, with "Red Island lightship No. 3" in white on her sides, is moored in 20 fathoms with Red Islet lighthouse bearing 228° , distant 3.3 miles, and exhibits two fixed white lights, one on the foremast 34 feet above the sea, the other on the mainmast 22 feet above the sea, both of which should be seen, in clear weather, a distance of 11 miles.

Fog signal.—During thick or foggy weather and snowstorms, the lightvessel sounds, by means of a steam fog whistle, 1 blast of 10 seconds duration every minute.

Submarine fog bell.—A submarine bell fitted to Red Island lightvessel, during thick or foggy weather, strikes the lightvessel's number, "3," every 14 seconds, thus: 3 strokes at intervals of 2 seconds between strokes; interval 10 seconds. There may be slight variations in these intervals.

Buoys.—A conical steel buoy, painted red and numbered 34B, is moored with Red Islet lighthouse bearing 208° , distant 2.9 miles, and marks the northeastern end of Red Islet bank.

A red can buoy with a flag, No. 36B, is moored with Red Islet lighthouse bearing 248° , distant 1.1 miles, and marks the southeastern edge of Red Islet bank.

Leading marks.—The southeastern beacon on Green island, in line with Green Island lighthouse, bearing 136° , leads northeastward of Red Islet bank; both the beacon and lighthouse are white. White islet, twice its own breadth, open northward of Hare island 212° , leads southeastward; but as these marks are distant, and may be obscured by mist or fog, the lead should not be neglected, nor the bank approached to less than the depth of 9 fathoms at low water. There are no marks for leading northward and westward of this bank, nor do the soundings there afford sufficient warning for the safety of a vessel.

White islet, $9\frac{1}{2}$ miles 210° from Red islet, is small, 38 feet high, wooded, and presents the appearance of a clump of trees on Hare Island North reef.

Hare Island North reef, or White Islet reef (battures de l'île Blanche), is composed of a narrow ridge of slate with numerous boulders on and skirting it, extending northeastward 3.3 miles from White islet, and southwestward from the islet to Hare island. White islet is the only conspicuous object on the reef, although there are other small heaps of boulders that never cover. The flood stream sets westward very strongly on and over the northeastern end of this reef, and therefore it must be guarded against.

Rock.—There is a rock with 3 feet least water over it just off the northern end of the reef on the following bearings: Northeastern extreme White islet 209° , distant 2.8 miles. Cacouna Island summit (station) 108° , distant 5.6 miles. Vessels should not pass between White Islet Reef lightship and this rock, because the tides set very strongly over it and across the reef.

Lightvessel.—A lightvessel with two masts and painted red, with "White Island reef, No. 5," in white on her sides, is moored in 8 fathoms water about 650 yards northeastward of the northeastern end of White Islet reef, and exhibits two fixed white lights, one on the foremast at 24 feet and the other on the mainmast at 27 feet

above the sea, both of which should be seen, in clear weather, a distance of 10 miles.

Fog signal.—During thick or foggy weather and snowstorms the lightvessel sounds, by means of a steam fog whistle, 2 blasts every 2 minutes and 44 seconds, thus: Blast, 8 seconds; silence, 8 seconds; blast, 8 seconds; silence, 2 minutes and 20 seconds.

Submarine fog bell.—A submarine bell fitted to White Island Reef lightvessel, during thick or foggy weather strikes the lightvessel's number, "5," every 18 seconds, thus: 5 strokes at intervals of 2 seconds between strokes; interval, 10 seconds. There may be slight variations in these intervals.

Leading marks.—The beacon at Cacouna, on the eastern shore of the mainland, open westward of the church leads eastward; and Hare island well open southward of White islet leads southward of the northeastern part of the reef. At night or in foggy weather this reef should not be approached nearer than a depth of 10 fathoms at low water.

Hare island, the northeastern end of which bears 198° , distant 1.6 miles from White islet, is nearly joined to that islet at low water, when the passage between is not available even for boats. The island is 7.2 miles long, nearly southwest and northeast, with a greatest width of about $\frac{3}{4}$ mile; it rises, apparently in an inclined plane from both ends, to a summit 323 feet high, situated 2.3 miles from its northeastern end, and it is densely wooded. There are a few houses on the southeastern side of the island $1\frac{1}{2}$ miles from its northeastern end and a solitary house 2 miles southwestward of them.

A narrow isolated reef, 2 feet high, and extending nearly $\frac{3}{4}$ mile northeast and southwest, lies 600 yards south-southeastward of the northeastern end of Hare island, and a small wooded islet is joined at low water to its southwestern end.

Beacons.—A diamond shaped and a pyramidal beacon stand close westward of the eastern houses mentioned above, and at 1 mile from the southwestern end of the island there are two pyramidal beacons and one diamond beacon.

Brandy Pots are three islands joined together at low water, situated eastward of Hare island, about $1\frac{3}{4}$ miles southward from its northeastern end. The channel separating these islands from Hare island is 800 yards wide, with a reef nearly in the middle, and through which a greatest depth of 9 feet can be carried at low water, though there is a curious deep hole at its southwestern entrance.

The northwestern Brandy Pot is the largest, being about 800 yards long, nearly northeast and southwest, and 200 yards wide; it rises 170 feet into a wooded conical summit and falls in cliffs to the northward. The northeastern islet is small and wooded, and about 30 feet high.

The eastern islet is white and almost bare of trees. Its southeastern extreme has deep water close-to.

Light.—A circular gray tower, having a red lantern, rising from the middle of a square white dwelling with a red roof, the whole building being 39 feet high, and situated at 84 yards within the southeastern end of the eastern Brandy Pot, exhibits at 71 feet above high water a fixed white light, which should be seen in clear weather a distance of 10 miles.

Brandy Pot bank, on which the depths are less than 3 fathoms, extends southeastward of Hare island and both northeastward and southwestward of Brandy Pots.

An isolated rock with 12 feet water on it is situated 209°, 1½ miles from Brandy Pots lighthouse and a little more than ¾ mile from the nearest point of Hare island. A shoal with 18 feet water over it is situated 209°, 3½ miles from Brandy Pots lighthouse; a rock with 16 feet water over it, 600 yards west-southwestward of the shoal; and a bank with 17 feet water on it is situated 104°, 900 yards from the southwestern point of Hare island.

Leading mark.—To clear the outer depth of 17 feet on the bank northeastward of Brandy Pots, keep the whole of Pilgrim islands well open southeastward of Brandy Pots.

Anchorage.—Small vessels seek shelter northeastward or southwestward of Brandy Pots, according to the wind, in 13 to 16 feet water.

Large vessels anchor as convenient in Brandy Pots channel or Hare Island channel south of Middle bank. The holding ground is good throughout.

Tides and tidal streams.—It is high water, full and change, at Brandy Pots at 3h. 0m.; springs rise 17 feet, neaps 10 feet.

Height of tide at every hour after low and high water ordinary spring tides:

Place.	After low water.		Flood tide.	After high water.		Ebb tide.
At Brandy Pots	<i>h.</i>	<i>m.</i>	<i>Ft. in.</i>	<i>h.</i>	<i>m.</i>	<i>Ft. in.</i>
	0	0	0 0	0	0	17 0
	1	0	1 3	1	0	15 0
	2	0	4 7	2	0	12 0
	3	0	9 5	3	0	8 6
	4	0	13 8	4	0	5 6
	5	0	16 0	5	0	3 0
	5	50	17 0	6 0		1 0
				6 34		0 0

In neap tides, the rise and fall not being so great as in ordinary springs, the proportionate rise and fall for every hour is also less, and an allowance must be made accordingly.

In Brandy Pot channel the flood stream begins 3h. 50m. after high water at Quebec, and it runs for 6h. 5m.; the ebb stream begins 2h. 30m. before high water at Quebec, and it runs for 6h. 20m.

The rate of the tidal streams is $2\frac{1}{4}$ to $3\frac{1}{2}$ knots in the southern channel.

Hare island South reef (battures de l'île aux Lièvres).—The nearest portion of this reef that dries at low water is $1\frac{1}{2}$ miles southwestward of Hare island, whence the reef extends southwestward about $3\frac{3}{4}$ miles. The channel between Hare island and the reef has a greatest depth of 18 feet at low water, and the tidal streams sweep through it at a rate of 4 to 5 knots at springs, eddying with strong swirls on the ebb.

The local steamers between Murray bay and Rivière du Loup use this channel.

On Hare island South reef there are four islets; the two northeastern are covered with grass and a few small bushes 6 feet above high water, and the southwestern is a sand bank covered with grass and is 4 feet high; the largest is between these, and has some spruce trees on its summit, the highest of which is 22 feet high.

Hare Island knoll.—Northeastward of the eastern end of Hare Island South reef and about 1.4 miles southeastward of the southwestern end of Hare island is Hare Island knoll, on which is a depth of 15 feet.

Buoy.—A conical red buoy, No. 48 B, is moored about 200 yards north-northeastward of the knoll.

Hare Island bank extends south-southwestward 6 miles from South reef, and also runs along its entire eastern side, extending out about $\frac{3}{4}$ mile.

Buoy.—A red conical buoy, No. 52 B, is moored in 5 fathoms water on the southeastern edge of the bank at about 1 mile from its southwestern end, with the two white beacons on the eastern end of Grande island in line.

Barrett ledges are two small rocks with deep water between and around them. The northeastern rock has 7 feet water over it and is situated 74° , 2.4 miles from Brandy Pots lighthouse, and the southwestern, with 12 feet water over it, lies 230° , 800 yards from the eastern rock.

Lightbuoy.—A red and black horizontally striped pillar light and bell buoy, No. 38B, is moored close northeastward of the northeastern rock, and exhibits an intermittent white light, the light being eclipsed about every 6 seconds.

Buoy.—A red and black horizontally striped can buoy, No. 40 B, is moored close northeastward of the southwestern rock, with a dia-

mond-shaped beacon in line with the northeastern extreme of Brandy pots.

Leading marks.—The highest hill over St. André, open eastward of Great Pilgrim island, bearing 199° , leads southeastward, and Hare island summit, in line with the northeastern extreme of Brandy Pots, bearing 253° , leads northward of these ledges.

Marmen rock, with 7 feet water over it, is 107° , 1.6 miles from Brandy Pots lighthouse. Middle shoal, with 9 feet water on it, lies 300 yards southwestward of Marmen rock, and Demers rock, with 11 feet water over it, lies 700 yards southwestward of Middle shoal, and 123° nearly $1\frac{1}{2}$ miles from Brandy Pots lighthouse.

Buoys.—A red and black horizontally striped can buoy, No. 42 B, is moored close northeastward of Marmen rock; and a red and black horizontally striped can buoy, No. 44 B, is moored close southwestward of Demers rock.

Leading marks.—Mount Éboulements summit, shut in with the southwestern extreme of Hare island, bearing 232° , leads close northwestward, and the apparent eastern summit on the southern shore of the river in line with the northern extreme of Cacouna island, bearing 49° , leads close southeastward of these banks.

Middle bank extends about southwestward from Middle shoal to Hare Island bank, and the greatest depth on it is 27 feet. A patch, with 17 feet water on it, lies on this bank at 90° , 2 miles from the southwestern end of Hare island, and a shoal, with 18 feet water over it, lies at 800 yards north-northeastward of that patch, with the eastern end of White islet in line with the southwestern end of Brandy Pots, 14° .

Buoy.—A red and black horizontally striped can buoy, No. 46B, is moored in 25 feet water on the southeastern edge of Middle bank and southward of the 17-foot patch, with the two pyramidal beacons on Hare island in line and White islet about midway between Brandy Pots and Hare island.

Leading mark.—The northeastern extreme of Hare island in line with the eastern end of Brandy Pots, bearing 351° , leads across the northeastern end of Middle bank in 27 feet water.

Brandy Pot channel is between Barrett ledges and Middle bank on the east, and Hare island, Brandy Pots, and Brandy Pots bank on the west. The least depth in the channel is 11 fathoms; but to go from it to South channel the shoal water northeastward of Hare Island bank must be crossed.

Morin shoal lies nearly in midstream about 8 miles above Hare Island bank and between Kamouraska and Murray bays; it is about $\frac{1}{2}$ mile long, nearly northeast and southwest, and 300 yards broad

within the 10-fathom line. The least depth on the shoal, which is hard ground, is $3\frac{1}{2}$ fathoms near its southwestern end.

Light, whistling and bell buoy.—A combination light, whistling and bell buoy, painted red and black in horizontal bands, is moored on the shoalest part of the shoal, with Kamouraska lighthouse bearing 77° , distant 7.3 miles, and it exhibits a white light, eclipsed at short intervals. The light is carried on a skeleton superstructure, 30 feet above the sea, and should be seen, in clear weather, a distance of 12 miles.

English bank extends from about 4 miles northwestward of Orignaux point southwestward 10 miles to Middle ground, with a general width of 1 mile; from the northeastern end of the bank depths of 9 to 12 fathoms continue north-northeastward to Morin shoal and northward for about 5 miles. The least depth on the bank is 5 fathoms, and there are depths of 6 fathoms on the ridge of the bank eastward to a line drawn about 320° from Ouelle point. The bank and the shoal water northward of it afford good anchorage, which is much used by vessels with a foul wind to await a favorable tidal stream.

SOUTH SHORE, GREEN ISLAND TO ST. ROCH DES AULNAIES.

Green island.—(See p. 322.) The western coast of Green island trends southwestward $4\frac{3}{4}$ miles from the lighthouse, and is bold and rocky. The southwestern point of the island is low and bare; from it a reef extends southwestward 1 mile, curving northward beyond the general direction of the coast, so that from the western end of the reef the lighthouse bears 40° . The northwestern side of this reef is so bold that there is no warning by the lead, and at night vessels should not approach it to less than 25 fathoms water, nor bring the light to bear northward of 48° until the northeastern end of Cacouna island bears 137° , which bearing leads to the westward.

The channel between Green island and the mainland is $\frac{3}{4}$ mile wide in its narrowest part, and it dries at low water, except in a boat channel.

Tidal streams.—The flood stream sets strongly over the tail of the reef off the southwestern end of Green island toward Cacouna island, and the ebb in the contrary direction. During the flood there is generally a great rippling off the end of the reef caused by the meeting of the streams from either side of Green island.

Isle Verte village is situated on the mainland eastward of Green island; it contains flour, carding, and saw mills, and its population in 1902 was about 4,600. There is a station of the Intercolonial railway, and a pier 1,283 feet long.

Anchorage.—Midway between the southwestern end of Green island southern reef and Cacouna rock there is good anchorage and shelter from easterly winds, in 6 fathoms, mud bottom, but as there might be difficulty in getting out with a westerly wind it is seldom used.

Rivière des Vases lies on the mainland about midway between Green island and Cacouna; on the eastern side of the river there is a wharf with a depth alongside it of 6 feet at high water. The chief trade here consists in the marine grass, called “herbes à barnaches,” which is gathered in boats and landed inside the river.

Cacouna island, the eastern end of which lies southward $2\frac{1}{4}$ miles from the southwestern end of Green island, is about 1.4 miles long, northeast and southwest, 600 yards wide, and 281 feet high; it is generally wooded, over gray rocks, faced by cliffs on the northern side, and is rendered conspicuous by its isolated position and elevation, which is greater than that of the adjacent land.

The island is distant about $\frac{1}{2}$ mile from the mainland, the passage between being dry except at very high tides, and there is a causeway to it that rarely covers. There is a depth of 6 fathoms water at 200 yards from the southwestern point of the island.

Cacouna rock, 25 feet high, is joined to the northern end of Cacouna island, from which it is distant 600 yards, by a reef of slate that dries at low water.

Cacouna, a thriving village, with a population of 589 in 1901, is situated on the mainland southeastward of the southwestern end of Cacouna island, and is much frequented by tourists in summer. It has a large Roman Catholic church with a spire, a small Episcopal church with a spire, and a Presbyterian church with a belfry; the last is not visible from seaward.

A large hotel with three projecting wings, painted white, stands near the edge of the cliff that rises close southwestward of the pyramidal beacon which stands below the church. Numerous villas of the summer residents and houses of the stationary population line the road for some distance southwestward of the hotel. The beach here is one of the prettiest on the St. Lawrence.

The post and telegraph office stands opposite the church.

There is a wharf at Cacouna with a depth alongside it of about $12\frac{1}{2}$ feet at high water.

Percée rock is in two parts that together extend 1.2 miles parallel to, and distant nearly 1 mile from, the south shore of the St. Lawrence. The northeastern part is 1.8 miles above Cacouna island, and is a small round rock 9 inches above high water; the southwestern part is 1 foot high, nearly 1 mile long, and very narrow. Shoal water

surrounds the rock from 200 to 400 yards, and a tortuous channel with $3\frac{1}{4}$ fathoms water in it lies between the reef and the shore.

Leading marks.—The eastern extreme of Green island, open northwestward of Cacouna rock, bearing 37° , leads northwestward, and the apparent extreme point northeastward of Cacouna island, in line with the eastern end of that island, bearing 39° , leads close southward of the rocks. At night these rocks should not be approached to a depth less than 8 fathoms.

Rivière du Loup, the entrance to which is $5\frac{1}{2}$ miles southwestward of Cacouna island, is a considerable stream, with a depth of 2 feet in its entrance at low water, but the river dries across at a short distance within the inner end of the pier described below. A depth of about 10 feet can be carried at high water to the mills near the bridge, a distance of 1.3 miles. Near the bridge water can be procured with considerable difficulty.

A pier extends about 1,600 feet from the northern entrance point of the river, with a depth of 16 feet at low water alongside its head. A railway in connection with the Intercolonial system extends to the end of the pier.

A small hotel and telegraph office stand at the inner end of the pier, and a flagstaff on the point. This point is a favorite watering place, and during summer, from June to October, has daily communication with Quebec by steamer.

Light.—A square white lighthouse, 35 feet high, on the end of the pier at Rivière du Loup point, exhibits at 36 feet above high water a fixed white light which should be seen in clear weather a distance of 11 miles.

Marine signal and telegraph station.—There is a signal and telegraph station at the lighthouse.

Anchorage off Rivière du Loup point in depths of 4 to 5 fathoms, with good holding ground, is sheltered from all but northerly winds, which are rare. There is a depth of 4 fathoms at 400 yards from the pier: the deeper water is with the court-house in line with Rivière du Loup point.

Tides.—It is high water, full and change, at Rivière du Loup pier at 3h. 10m.; springs rise $16\frac{1}{4}$ feet, neaps $10\frac{1}{2}$ feet; neaps range 7 feet.

Rivière du Loup or Fraserville town, situated close inshore of the entrance to the river, and the chief town of the county of Témiscouata, had a population of 4,569 in 1901. It contains a prominent stone church with a spire; the court-house, a conspicuous square stone building at about 250 yards westward of the church; a small Protestant church with a square tower; and several manufactories, including two pulp mills. There are post and telegraph offices in

Fraserville, and the engineering works of the Intercolonial railway are grouped about its railway station. The Témiscouata railway runs from Rivière du Loup to Edmundston, where it connects with the Canadian Pacific system.

Supplies of all kinds can be obtained here. The Intercolonial railway supplies coal, which can be taken in from trucks at the end of the pier; about 1,600 tons are kept in stock at Rivière du Loup, and about the same amount both at St. Flavie and St. Charles junction, but any quantity can be brought from the Pictou collieries in 50 hours, or from Springhill in 39 hours.

The coast.—The land in the vicinity of Fraserville consists of a series of ridges parallel to the shore, and separated by valleys under cultivation. From the valley just southward of the ridge that terminates in Rivière du Loup point, rises a remarkable isolated hill, 280 feet high, that from the westward appears as a sharp cone. The shore ridges, all of which are faced by cliff on the river side, extend to Notre Dame du Portage, the cliff about 2 miles southwestward of Fraserville being surmounted by a flagstaff and a summer house, 186 feet above high water. Behind these ridges the main hills are almost flat in outline, and slope gradually seaward from elevations of 400 to 550 feet.

Notre Dame du Portage parish church, which has a spire, is close to the shore 5 miles southwestward of Rivière du Loup point.

Loup bank extends southwestward from Rivière du Loup point towards Pilgrim islands, in which direction it shallows gradually.

Leading mark.—Rivière du Loup lighthouse, well open southward of the isolated conical hill, bearing 61° , leads northwestward of the depth of 18 feet on this bank, and also of Pilgrim shoal.

Pilgrim shoal.—The northeastern end of this shoal lies southwestward $4\frac{1}{4}$ miles from Rivière du Loup lighthouse, and the shoal extends about 5 miles southwestward or nearly parallel to the southern shore of the river, from which it is distant $3\frac{1}{4}$ miles. The southwestern end of the shoal lies 10° , 1.8 miles from Long Pilgrim lighthouse. The least depth on the shoal is 13 feet near its southwestern end, but the general depth on it is 16 to 18 feet; the channel between the shoal and Loup bank is 400 yards wide at its narrowest part, and carries a depth of 19 feet.

Leading marks.—The mark for clearing Loup bank leads northward of the shoal; the eastern end of Green island, well open northward of Cacouna rock, bearing 38° , or the northwestern sides of Grande and Burnt islands (Kamoukaska) in line, bearing 211° , leads westward of this shoal.

Light and bell buoy.—A black cylindrical gas and bell buoy, No. 51B, surmounted by a steel frame supporting a bell and lantern, is moored in 5 fathoms water on the southwestern side of Pilgrim shoal with the northeastern end of Great Pilgrim island bearing 110° , distant 1.8 miles, and it exhibits an intermittent white light, the light being eclipsed about every 6 seconds.

Pilgrim islands are a group of four islands and some rocks extending northeastward and southwestward about $4\frac{1}{2}$ miles. The channel between these islands and the main is shoal.

Great Pilgrim, the eastern island, the eastern end of which is situated 220° , $5\frac{1}{2}$ miles from Rivière du Loup point, is about $\frac{3}{4}$ mile long, northeastward and southwestward, and 250 yards wide. It is of bare gray rock partly covered with turf, and with small wood in the hollows between the hills. Each end rises to a round hill, the eastern 218 feet and the western 223 feet above high water, and between these is a smaller summit faced by gray cliffs.

Middle Pilgrim island is partly wooded and 181 feet high. The other smaller islands present generally the same characteristics.

Long Pilgrim, the western island, is about 3 miles long, north-northeastward and south-southwestward, narrow; and its eastern end rises to a partly wooded hill, 128 feet high, from which the island extends in a narrow ridge faced by gray cliff to a small, bare islet, 10 feet high, at its southwestern end. At high water there is a gap at $\frac{5}{8}$ mile northeastward from its southwestern end, through which boats can pass when the water is smooth.

Light.—A circular white lighthouse with a red lantern roof, rising from the middle of a square dwelling, the whole building being 39 feet high, on the top of Long Pilgrim island, at $1\frac{3}{4}$ miles from its northeastern end and 108 yards within its western coast, exhibits at 136 feet above high water a fixed white light which should be seen in clear weather a distance of 12 miles.

Anchorage.—There is anchorage for small craft in westerly winds under Long Pilgrim island, and off Great Pilgrim island in 15 feet water.

St. André village, containing a church built of stone, with a spire, is situated on the southern shore of the St. Lawrence south-eastward of the southwestern end of Long Pilgrim island. At the eastern end of the village is a large factory for the manufacture of agricultural implements; the village also contains a foundry. The population is about 2,500 (1902).

A wharf, consisting of an earthen embankment 850 feet long and of 9 piers connected by platforms with 30-foot spans, extends from the

village. The Intercolonial railway passes one of its stations at about 3 miles inland from the village.

Point St. André, a round island about 800 yards long, north and south, 300 yards wide, and 126 feet high, is joined to the mainland at $\frac{1}{2}$ mile southwestward of St. André by a grassy flat 350 yards wide that covers only at high water.

The shore in this locality rises to several remarkable hills, the highest, at 1.3 miles 185° from St. André church, being a conical hill, 630 feet high, with a similar hill, 565 feet high, at $\frac{1}{4}$ mile northward of it.

St. Alexandre church, the spire of which rises 585 feet above high water, inland 4.4 miles, 84° from St. André church, is occasionally visible from the channels in the river.

St. André bank extends southwestward between Pilgrim and Kamouraska islands, and in many places it dries out more than 1 mile from the shore of the mainland; its western edge is very steep.

Leading mark.—The southeastern sides of Grande and Burnt islands in line, bearing 211° , lead along it at 300 to 400 yards from the 3-fathom line of soundings until near Grande island.

Kamouraska islands lie nearly 6 miles southwestward of Pilgrim islands, and $2\frac{1}{2}$ miles from mainland, to which they are joined by shoals that dry at low water. Grande island, the northeastern, and Burnt island extend about 2 miles along the western edge of the bank, which stretches off the eastern shore of the river.

These islands are narrow ridges of graywacke rock about $\frac{3}{4}$ mile long, and are bold to the westward, there being 20 fathoms water close to them. Crow island lies about $\frac{3}{4}$ mile southward of Burnt island and the same distance offshore; there are also two small and bare rocky islets within Burnt island. Carts can cross from the mainland to Crow island at low water. There is no water on the islands.

Light.—A square white lighthouse, 39 feet high, with a dwelling attached, situated at 240 yards from the northeastern end of Grande island, and 160 yards from the water, exhibits at 105 feet above high water a revolving white light, which attains its greatest brilliancy every $\frac{1}{2}$ minute, and should be seen in clear weather a distance of 16 miles. The lighthouse lantern and the dwelling roofs are painted red.

Beacons.—There are two white beacons on the northeastern end of Grande island, which in line, bearing 159° , lead to the red buoy on the southwestern end of Hare Island bank.

Kamouraska village, on the shore of the river southeastward of Crow island, is a favorite summer resort; it contained a population of 578 in 1901. Near the village church, which has a spire, there is a wharf and a good landing, and fresh water can be obtained when the tidal rise enables boats to cross the shoals.

Kamouraska bay, southward of the village and between it and cape Diable, is well sheltered, and small vessels safely lie aground and winter there, on a mud bottom, which dries at low water. Vessels in distress, having lost their anchors, may run in at high water between the reef off cape Diable and Crow island, leaving the island $\frac{1}{4}$ to $\frac{1}{2}$ mile to the northeastward in passing, and then haul southwestward into the bay within the reef. At high spring tides there is a depth of 13 to 14 feet of water over the mud, but at neap tides there is seldom more than 9 to 10 feet.

Anchorage.—There is good anchorage off Kamouraska with the prevailing winds up and down the river, but it is open to northwesterly winds. The best berth is with Kamouraska church, just open southwestward of Crow island, bearing 113° , and Grande island, just open northward of Burnt island, bearing 41° . There is a depth of 7 fathoms over stiff mud at 800 yards from the 3 fathoms edge of the bank. Large vessels may anchor farther westward.

Cape Diable lies southwestward nearly 3 miles from Crow island, across Kamouraska bay, and reefs of slate extend from it northward more than midway to Crow island, and northwestward $\frac{3}{4}$ mile, in which direction the distance out to the 3 fathoms edge of the bank is nearly $1\frac{1}{4}$ miles.

Orignaux point is a low point extending from some low hillocks, at $7\frac{3}{4}$ miles southwestward from cape Diable. From the point a pier extends 1,200 feet, with a crosshead, alongside which there is a depth of 11 feet at low water. Close southward of the pier a large hotel and some small houses stand on the hillocks. The outer end of the pier is the terminus of a branch of the Intercolonial railway, which runs from Rivière Ouelle station, and trains connect with a steamer which crosses to Murray bay and other places on the north shore several times a day during the summer.

Light.—A rectangular white lighthouse with a red roof, surmounted by an octagonal white lantern, 32 feet high, on the end of the pier at Orignaux point, exhibits at 36 feet above high water a fixed white light, that should be seen in clear weather a distance of 10 miles.

Anchorage.—There is good anchorage also about a mile northwestward of the pier in 6 fathoms water, and as close in as convenient, there being a depth of 18 feet at 600 yards from the pier.

Vessels loading timber from rivière Ouelle generally anchor here.

Shoal water.—From off Orignaux point the edge of the shoal water trends southwestward, gradually increasing its distance from the shore, to the shoals of St. Anne, whence it turns southward, gradually decreasing its distance from the shore.

Tides and tidal streams.—It is high water, full and change, at Orignaux point at 3h. 47m.; springs rise $17\frac{1}{2}$ feet, neaps 13 feet; neaps range $9\frac{3}{4}$ feet. The flood stream begins in the offing 5h. 0m. after high water at Quebec, and it runs 5h. 55m. The ebb stream begins in the offing 1h. 35m. before high water at Quebec, and it runs 6h. 30m.

Rivière Ouelle flows into the St. Lawrence just southward of Ouelle point, a prominent projection at 3.8 miles southwestward of Orignaux point, and the western prominent projection along this part of the coast. The point rises gradually to a height of 108 feet, the western summit of a partly wooded ridge that extends some distance inland. A depth of 12 feet at high water can be carried up rivière Ouelle as far as the wharf, which is situated on the southern side of the river at $1\frac{1}{2}$ miles from the point.

The best channel passes southward of a small islet about midway to the wharf. Notre Dame de Liesse church, which has a spire, stands close eastward of the bridge that spans the river at 2 miles from Ouelle point.

Ste. Anne de la Pocatière village, which contains a conspicuous church with a spire and a large college, stands on the slope of mont Ste. Anne, a prominent round hill, 395 feet high, situated 167° , 3.7 miles from Ouelle point. Several conspicuous isolated hills lie southwestward of mont Ste. Anne; and mont Boutot, a remarkable truncated cone 708 feet above high water, lies $2\frac{1}{2}$ miles northeastward of Ste. Anne.

St. Roch des Aulnaies (Aulnets) is a small village situated southwestward $6\frac{1}{2}$ miles from Ste. Anne de la Pocatière, and it contains a church with two small spires, which stands close to the shore. Houses are situated along the road between these villages.

Beacons.—There is a pyramidal beacon close to the church, and another on an elevation at 131° nearly $\frac{3}{4}$ mile from the first beacon.

A pyramidal beacon stands just southward of the edge of the cliff at $1\frac{1}{2}$ miles southwestward of the church, and inland at 130° , $\frac{1}{4}$ mile from it stands one shaped like a diamond.

There is a pier at St. Roch des Aulnaies.

Coast.—The shore from St. Roch des Aulnaies takes a southwestward direction for about 7 miles to St. Jean Port Joli and is generally bordered by small cliffs, the ends of slopes from wooded hills that rise 320 and 290 feet above high water.

Shoals of Ste. Anne extend about 5 miles westward from the shores of Ste. Anne bay, which lies between Ouelle point and St. Roch des Aulnaies.

The water shoals very rapidly along the greater part of the outer edge of the shoals, the distance between depths of 5 and 3 fathoms being less than 200 yards, and thence to 6 feet less than 800 yards.

Buoys.—A black can buoy, No. 53B, lies in 7 fathoms on the northern edge of Ste. Anne shoals, with Orignaux Point lighthouse bearing 56° , distant 5.7 miles.

A black can buoy, No. 55B, lies in 5 fathoms on the western point of the shoals, with Ouelle point bearing 73° , distant $6\frac{1}{2}$ miles, and Lower Traverse lighthouse 217° , distant 2.9 miles.

Leading mark.—Cape Diable, well open northward of Orignaux Point lighthouse, bearing 56° , leads northwestward of, but close to, Ste. Anne shoals southwestward of a line drawn about 310° from Ouelle point.

Caution.—The first of the flood stream sets directly on to the shoulder of the bank in the vicinity of the lower buoy, and obliquely to the westward. These shoals are dangerous and caution must be observed in their vicinity.

Anchorage.—There is excellent anchorage in from 7 to 10 fathoms, stiff mud bottom, along the edge of the bank from Kamouraska islands to Ste. Anne upper buoy, No. 55B.

The shoals trend southwestward 2.9 miles from Ste. Anne upper buoy to Lower Traverse lighthouse.

SOUTH CHANNEL, GREEN ISLAND TO THE NORTHEASTERN ENTRANCE OF SOUTH TRAVERSE.

General remarks.—South channel is preferred for navigation to North channel, for the following reasons: In that part of it which is below the Traverse the tidal streams are not so strong, nor is the water so inconveniently deep, as in the corresponding part of North channel, and it possesses water enough for vessels of heavy draft at all times of tide, with good anchorage in almost every part.

Vessels of heavy draft should not use Brandy Pots channel, westward of Middle bank, as there are not more than 21 feet at low water in crossing over the southwestern part of Middle bank to the main channel, but such vessels should pass eastward of Barrett ledges, Middle shoal, and Middle bank, where the channel is direct. With the assistance of the buoys large vessels beat up or down South channel with safety.

Directions from Green island to the northeastern entrance of South Traverse (see pp. 318 and 319).—Steering a course from Bic island, pass about 2 miles off Green Island reef, or about $1\frac{1}{2}$ miles southeastward of Red Islet lightvessel. To avoid Green Island reef keep the High land of Bic well open northward of Basque island. When the eastern beacon on Green island is in line with the lighthouse, steer 205° to pass southeastward of Barrett ledge. The highest hill of St. André, open eastward of Great Pilgrim island, bearing

199°, leads southeastward of these shoals, but except in thick weather the buoy should be the guide. From a position about 1,200 yards southeastward of Barrett Ledge bell and lightbuoy, and with the buoy abeam, steer 216°, with Green Island lighthouse just shutting in with the western end of Green island astern. When Fraserville church bears 83° keep a little to the westward and bring the northwestern sides of Grande and Burnt islands in line, bearing 211°, and keep the range on steering in the fairway, passing 600 yards northwestward of Pilgrim Shoal lightbuoy to a position about 1 mile northwestward of Long Pilgrim lighthouse, having the lighthouse abeam. Thence steer 217° to pass about $\frac{3}{4}$ mile northwestward of Grande Island lighthouse, whence steer a direct course 227° toward Middle Ground lightbuoy, thus giving Orignaux point and the shoals off Ouelle point a good berth.

In following these directions care must be given to the state of the tides and to the clearing marks for the dangers already given.

At night from Bic island steer to pass between Red Islet bank and Green island, and when Red Islet lightvessel bears about 320° distant $1\frac{1}{2}$ miles and Green Island light 140° distant $2\frac{3}{4}$ miles, steer 208° direct for Barrett Ledge lightbuoy, but upon approaching it of course steer to the southward so as to leave it on the starboard hand. When past Green island the lights of White Island Reef lightvessel, Red islet, and Brandy Pots are guides. Having passed about $\frac{1}{2}$ mile southeastward of Barrett Ledge lightbuoy, steer 218° to pass $\frac{1}{2}$ mile northwestward of Pilgrim Shoal light and bell buoy. Now steer 214°, passing 1.4 miles northwestward of Long Pilgrim light and about $\frac{3}{4}$ mile northwestward of Grande Island light, whence steer a direct course 227° toward Middle Ground lightbuoy.

Caution.—The vessel's position should be frequently ascertained by bearings and soundings, particularly when near Ste. Anne shoals at the beginning of the flood stream.

Tidal streams.—(See p. 475.)

NORTH SHORE, LITTLE BERGERON COVE TO CAPE CORBEAU AND COUDRES ISLAND.

The north shore.—The northern shore of the St. Lawrence from Saguenay river to cape St. Joseph, a distance of about 48 miles, is bold and mountainous. The granite hills in most parts rise immediately from the river, forming steep or precipitous headlands. Near the entrance of the Saguenay these hills are not above 1,000 feet high, but mount Éboulements, 43 miles to the southwestward, rises 2,551 feet above high water.

Vaches point.—The northern shore of the river from Little Bergeron cove trends southwestward 5 miles to Vaches point, the north-

eastern entrance point of Saguenay river, from which Red Islet lighthouse bears 129° , distant $6\frac{1}{2}$ miles. This shore is bordered for about 400 yards by bowlders, and at $1\frac{1}{2}$ miles from Little Bergeron cove shoal water commences, extending to a position about 1.2 miles eastward of Vaches point. The most noticeable landmarks in the neighborhood are the high clay cliffs near the Saguenay and the sand hills at Vaches point.

Moulin Baude anchorage, in 7 fathoms, mud, is 65° , $2\frac{1}{2}$ miles from point Vaches, with Red islet and the southwestern end of Green island in line 153° . It is of use for vessels, coming up under the northern shore with a scant northwesterly wind at the end of the flood and close of the day, to wait for the next flood or for daylight, and also for vessels waiting for a wind to enter the Saguenay. The position given is 800 yards distant from the 3-fathom line of soundings, nearly 1 mile offshore, and the water becomes deep immediately outside it.

Vaches Point reef dries out $\frac{1}{2}$ mile southeastward from Vaches point.

Vaches patch, with 13 feet water over it, lies $1\frac{3}{4}$ miles 103° from Vaches point, and is a continuation of Vaches Point reef.

Buoy.—A red conical buoy, No. 94 B, is moored 150 yards southwestward of the patch.

Rocky patches.—Two rocky patches lie about $1\frac{1}{2}$ miles northeastward of Vaches patch; the least depth found on them was 7 fathoms, but they may be extending eastward, and the depth over them may be decreasing.

Lights at point Noire, the western entrance point of the Saguenay (see p. 429.)

Prince shoal, a narrow ridge of stones and bowlders, with 17 feet least water, extends nearly 1 mile about northwest and southeast, and the eastern patch of the shoal lies 91° , $2\frac{3}{4}$ miles from Lark islet. This shoal is reported to have much less water than 17 feet.

Lightvessel.—A lightvessel, painted red, with "Prince shoal No. 7" on her sides in white letters, is moored in 4 fathoms on the southern edge of the western of the two southern patches of Prince shoal, and exhibits three fixed lights, thus: A white light on the foremast at 25 feet above water; a white light on the mainmast at 31 feet above water; and a red light on the stay between the masts at 49 feet above water; these lights should be seen, in clear weather, a distance of 9 miles. The lightvessel has two masts and carries a red ball at the mainmast head, which is lowered, and the mainmast light, also is not lighted, when she is out of position.

Fog signal.—In thick weather the lightvessel sounds by means of a steam fog whistle 2 blasts, each of 4 seconds duration, every minute, thus: Blast 4 seconds, silent interval 4 seconds, blast 4 seconds, silent interval 48 seconds.

Submarine fog bell.—A submarine bell, fitted to Prince Shoal lightvessel, during thick weather strikes the lightvessel's number, "7," every 22 seconds, thus: 7 strokes at intervals of 2 seconds between the strokes; interval, 10 seconds. There may be slight variations in these intervals.

Bar reef extends westward about 1 mile from a point $\frac{1}{2}$ mile westward of the southwestern patch of Prince shoal: the least depth on this reef is 9 feet.

Lark point (pointe à l'Alouette), the southwestern entrance point of the Saguenay, is $2\frac{1}{2}$ miles 182° from Vaches point. and is composed of clay cliffs.

Lark islet (île aux Morts) is composed of shingle and bowlders, is small and low, and lies 1 mile 57° from Lark point, to which it is joined by sand and bowlders dry at low water.

Light.— A square white lighthouse, 40 feet high, on the middle of Lark islet, exhibits, at 35 feet above high water, a fixed white light, which should be seen in clear weather a distance of 10 miles.

There is a white dwelling house near the lighthouse.

Lark reef (battures de l'Alouette) is composed of sand and bowlders, dry at low water nearly out to the edge of the shoal water, which extends all the way from a point $1\frac{1}{2}$ miles 55° from Lark point to a position 136° , $3\frac{1}{2}$ miles from Lark point, whence the shoal water turns sharply to the westward of southwest and joins the shore of the mainland just southwestward of Basque road. Lark patch, near the southern end of this reef, never covers. Between this extensive reef, including Bar reef and Prince shoal on the south and Vaches Point reef on the north, is the entrance of Saguenay river.

Buoy.—A red conical buoy, No. 96 B, is moored on the southeastern extreme of the reef with Lark Islet lighthouse bearing 334° , $3\frac{1}{2}$ miles.

Leading marks.—Brandy Pots, open southeastward of White islet, bearing 195° , leads about $\frac{1}{4}$ mile southeastward of Prince shoal and Lark reef; it also clears the rocky patches with a least depth of 7 fathoms, which lie $1\frac{1}{2}$ miles eastward of Vaches patch. The western half of Cacouna island open westward of Red islet, bearing 163° , leads eastward of these patches; and the southwestern end of Red islet in line with the southwestern end of Green island, 152° , leads westward of them.

Canard river is a small stream which is celebrated for wild ducks and the entrance of which is at the western termination of the clay

cliffs, $2\frac{1}{4}$ miles southwestward of Lark point; a boat can approach the river only near high water.

Échafaud islet is a small, steep, and rocky islet lying off the mouth of a cove full of rocks, 5 miles southwestward of Lark point. Lark reef terminates close southward of Échafaud islet, and from the islet the southern side of Lark reef trends eastward for about 5 miles.

Cape Basque, south-southwestward $6\frac{1}{2}$ miles from Lark point, is a very bold mountainous headland, with a depth of 20 fathoms close to it.

Basque road, between cape Basque and Lark reef, is a good anchorage, sheltered by the reef from easterly winds, and by the mainland from northerly and westerly winds as far southward as 203° . There is room for many vessels, but the best berth is with Échafaud islet bearing 272° distant rather less than 1 mile, in 10 fathoms, clay bottom, and nearly $\frac{1}{2}$ mile from the 3-fathom line. There is anchorage farther out in 13 fathoms, but the farther out the stronger the stream. At the anchorage recommended the tidal streams are not strong, and the holding ground is good. There is no anchorage off the northern shore anywhere southwestward of this to Murray bay, a distance of 28 miles.

Bay of Rocks, having an island and many large rocks in it, is about $2\frac{1}{2}$ miles south-southwestward of cape Basque, and affords shelter only to boats. There is a telegraph office here.

Cape Dogs, $5\frac{1}{2}$ miles south-southwestward of cape Basque, is quite bold, high, precipitous, and composed of bare granite.

The shore from cape Dogs trends south-southwestward 10 miles to cape Salmon, and is generally bold. At about 2 miles south-southwestward of cape Dogs is Shettle port, at $4\frac{1}{4}$ miles is rivière Noire, and at $7\frac{1}{2}$ miles is Port Parsley; these places are suitable only for boats. Improvements have recently (1902) been made at rivière Noire, which appears now to be a harbor available for small craft; there is a village and a wharf at the river.

Lights.—An octagonal white tower with a red roof, rising from the red roof of the drab freight shed on the wharf at the village of St. Simeon, situated on the St. Lawrence, $\frac{1}{2}$ mile above the mouth of the river Noire, exhibits, at 40 feet above high water, a fixed white light that should be seen in clear weather a distance of 11 miles. The light is visible over an arc of 163° from 210° , through west and north to 13° .

Fog signal.—A fog horn answers vessels' fog signals.

A square white lighthouse, with a red lantern, rising from the middle of the southeastern side of a dwelling, the whole building

being 46 feet high, and situated on a point about 900 yards north-northeastward of cape Salmon, and locally known as *pointe des Roches*, exhibits, at 82 feet above high water, a revolving white light, which attains its greatest brilliancy every 15 seconds, and should be seen in clear weather a distance of 14 miles.

The light is obscured by the land when bearing eastward of 35° .

Fog signal.—A steam fog horn, placed on the edge of the cliff southeastward of the lighthouse, gives blasts of 8 seconds duration with intervals of 22 seconds.

Cape Salmon is high and bold.

The bay between cape Salmon and cape Eagle, southwestward $5\frac{1}{4}$ miles from it, is formed by the shore trending westward and then south-southwestward; it is 1 mile from entrance to head, but affords no anchorage in consequence of the great depth of water. At about $1\frac{1}{2}$ miles westward of cape Salmon is Port Salmon, a small cove which large boats enter at high water.

The settlements on the northern shore of the St. Lawrence are continuous from Port Salmon along the river bank to Quebec, but eastward of the port they are more dispersed.

St. Fidèle village is situated about $1\frac{3}{4}$ miles above Port Salmon; it has a telegraph office and a wharf.

Cape Eagle, $5\frac{1}{4}$ miles southwestward from cape Salmon, is bold, high, and precipitous.

The shore from cape Eagle trends north-northwestward for about 600 yards and then southwestward $4\frac{3}{4}$ miles to cap à l'Aigle. It is clear of outlying dangers, but shoal water extends nearly $\frac{1}{4}$ mile off it, about 3 miles southwestward of cape Eagle.

Light.—A mast, 35 feet high on the end of a pier extending southeastward from the eastern part of cap à l'Aigle, exhibits, at 38 feet above high water, a fixed white light that should be seen in clear weather a distance of 6 miles.

Murray bay, or Mal baie, lies between cap à l'Aigle and *pointe au Pic*, which bears 216° , 2.8 miles from it, and the bay is 1 mile deep from entrance to head, but it is nearly all dry at low water, excepting the shallow channels through which the river Mal Baie discharges. This river, flowing down a beautiful valley from two or three small lakes among the hills, is rapid and unnavigable.

Shoal.—The flat which fills Murray bay commences about $\frac{3}{4}$ mile westward of cap à l'Aigle; thence its outer edge in 3 fathoms trends approximately southwestward to a position $\frac{1}{2}$ mile eastward of Murray Bay pier, and thence westward to the land northward of that pier. The southwestern end of the flat has depths of 4 feet over it in some places.

Buoy.—A red conical buoy, No. 100B, is moored on the southeastern extreme of the shoal off pointe au Pic in $2\frac{1}{2}$ fathoms water, with the pier light bearing 247° , distant $\frac{1}{2}$ mile.

Leading mark.—St. Irénée church, bearing 225° and well open southeastward of cape Sain, leads southeastward of this shoal, and vessels approaching the pier should keep its northeastern side hidden by the southeastern front.

Pier.—A pier, known as Murray Bay pier, extends southeastward from the shore at nearly 200 yards northeastward of pointe au Pic. It has a depth of 18 feet at its end at lowest tides.

Light.—A white lantern on the red roof of the freight shed on Murray Bay pier exhibits, at 36 feet above high water, a fixed white light that should be seen in clear weather a distance of 10 miles.

Anchorage.—The anchorage off Murray bay is close under the high rocky shore, with pointe le Heu, the northern point of the bay, bearing 261° , distant about 800 yards, and pointe au Pic 208° . The bottom here is clay, good holding ground, and the depth 12 fathoms, but the edge of the shoal water is distant only about $\frac{1}{4}$ mile. This position is out of the strength of the tidal streams, well sheltered from the prevailing winds, and a vessel well moored is safe, although inconveniently near the shore unless she be taking in cargo. There is anchorage a little farther out in about 16 fathoms, but the tidal streams are there very strong.

Anchorage has been obtained by a steamer in 17 fathoms, with the outer end of Murray Bay pier bearing 280° , distant about 800 yards.

Directions.—From the eastward for the anchorage off pointe le Heu give the shore a berth of $\frac{1}{3}$ mile, in order to avoid the shoal water which extends nearly $\frac{1}{4}$ mile offshore about midway between cape Eagle and point le Heu. From the westward keep St. Irénée church well open southeastward of cape Sain, in order to clear the edge of the shoal flat which fills Murray bay, and when St. Étienne (Murray bay) church bears 295° haul into the anchorage.

Murray bay is one of the best known and most frequented summer resorts on the northern shore of the St. Lawrence, and there are not many places in Canada that can be justly compared with it for beauty of scenery. The village, which contains St. Étienne church, is situated on both sides of the mouth of river Mal Baie, and the settlements extend some miles back from the St. Lawrence. There are grist and saw mills on the river, and lumber cut at the sawmills is shipped to Quebec mostly in small schooners, which lie aground near, or in the entrance of, the river. Occasionally vessels anchor off the bay and take in cargoes of lumber. In 1901 the population of Mal baie was 826 and of pointe au Pic 537.

Slight shocks of earthquake are not infrequent at Murray bay and between it and bay St. Paul, 20 miles southwestward.

Communication.—During summer, from June to October, steamers of the Richelieu and Ontario Navigation Company, running to and from Quebec, call at Murray Bay pier daily, and the traffic is heavy.

Telegraph.—There is a telegraph office at Murray bay.

The shore from pointe au Pic trends southwestward for $4\frac{3}{4}$ miles, when it turns southward for about 2 miles to Jareux point; it is bold to about 200 yards off it for the first 2 miles of this distance; thence it is bordered by a shoal for about $\frac{1}{4}$ mile.

St. Irénée village lies $4\frac{3}{4}$ miles south-southwestward of pointe au Pic; it contains a church, several sawmills, two grist mills, and a cheese factory. A pier extends from the shore abreast the village, at which steamers of the Richelieu and Ontario Navigation company call.

Light.—A small square lantern on the apex of the brown roof of the drab colored freight shed, at the outer end of St. Irénée pier, exhibits, at 32 feet above high water, a fixed light, which shows red to the eastward or downstream, and white to the westward and southwestward. It should be seen, in clear weather, a distance of 7 miles.

Fog signal.—At St. Irénée lighthouse a hand fog horn answers the fog signals of vessels in the neighborhood.

The shore at Jareux point becomes steep and trends south-southwestward $1\frac{3}{4}$ miles to cape Corneille.

Little Mal bay lies between cape Corneille and Goose cape, 1.2 miles farther south-southwestward, and is filled with a reef, which, however, does not extend beyond the line of its entrance points.

Goose cape is a small wooded bluff, the end of a spur of the higher ranges; it is bold, and landing may be effected, in ordinary weather, in a small cove westward of the lighthouse. The ebb stream off the cape is rapid. From the cape a shingle beach extends westward.

Light.—A square white lighthouse, 42 feet high, with dwelling attached, on Goose cape, exhibits, at 55 feet above high water, a fixed white light, that should be seen, in clear weather, a distance of 12 miles.

Mount Éboulements, 312° , $3\frac{1}{2}$ miles from Goose cape, is 2,551 feet high, and the highest peak of the ranges that form the northwestern side of the river in this locality: it is surrounded by smaller conical mountains.

Cape Martin bears 249° , 2.9 miles from Goose cape and is a conspicuous, sharp, projecting cliff. Shoal water lies in the bay between

these points, and attains, at about midway between them, a distance of nearly 1,200 yards from the shore.

Anchorage between Goose cape and cape Martin in 7 to 8 fathoms is good and sheltered from easterly winds. The best berth is with the western end of the shingle beach that extends westward from Goose cape bearing 295° .

Tidal streams.—The tidal streams, however, are irregular here and occasionally strong; thus in a vessel at anchor too far out in $8\frac{1}{2}$ fathoms, and only neaps, the first of the flood came round Goose cape with a great rippling, and set slanting on the shore at the rate of 5 knots, which soon decreased to $3\frac{1}{2}$ knots. About 1 hour from its commencement the rate of the stream increased to $4\frac{1}{2}$ knots, and after continuing so for a short time it decreased to $2\frac{1}{2}$ knots, which rate it retained for the remainder of the tide, setting fairly along shore. Farther out, in 10 fathoms, the ebb also is strong.

Leading mark.—Cape St. Joseph in line with cape Martin, bearing 251° , leads close southward of the depth of 18 feet at low water, within this anchorage.

Éboulements bay, between cape Martin and cape St. Joseph, 3 miles to the westward, is about 3 miles across and 1,200 yards deep, but it dries at low water, except in some channels through which *rivière du Moulin* discharges. In this bay small craft lie on the mud within the large boulders on the edge of the shoals.

Les Éboulements village, which contains the church of Notre Dame des Éboulements, 1,186 feet above high water, is situated north-westward $1\frac{1}{2}$ miles from cape Martin. Its population is about 900.

There is also a settlement on the shores of Éboulements bay.

The country in this locality is well cultivated, even on the steep slopes of the mountains.

Cape St. Joseph is the end of a promontory which is faced by sand cliffs; and a pier, with a depth of $9\frac{1}{2}$ feet at its end at low water, extends from the middle of the promontory. From these features the cape is easily recognized.

Light.—A lantern on the roof of a brown shed at the end of cape St. Joseph pier, exhibits, at 22 feet above high water, a fixed white light, that should be seen, in clear weather, a distance of 9 miles from all points of approach by water.

Fog signal.—A hand fog horn at the lighthouse at cape St. Joseph answers the fog signals of vessels in the vicinity.

Cape Corbeau lies about $3\frac{3}{4}$ miles westward of cape St. Joseph.

St. Joseph bank dries for about $\frac{1}{2}$ mile off the shore for 1 mile westward of cape St. Joseph, whence the bank gradually closes to cape Corbeau.

There is a conspicuous landslip on the shore at $1\frac{1}{2}$ miles westward of cape St. Joseph.

Light—Pier.—A lantern on the top of a drab colored freight shed at the end of a pier extending about 500 yards from cape Corbeau, exhibits, at 31 feet above high water, a fixed white light, that should be seen in clear weather, a distance of 10 miles.

Directions.—To clear the shoal water eastward and westward of cape St. Joseph, when going westward, keep the landslip open southward of the pier at cape St. Joseph, bearing 265° , until Goose cape is in line with cape Martin, bearing 64° , which latter range leads in mid-channel to St. Paul bay.

NORTH CHANNEL, LITTLE BERGERON COVE TO CAPE CORBEAU.

General remarks.—The channel northwestward of Red islet and its bank, and between the 3 fathoms limits of the latter and the shoals off Saguenay river, is $2\frac{1}{4}$ miles wide, with very deep water. North channel, farther southwestward, is much wider, being nowhere less than $3\frac{1}{2}$ miles in width.

North channel, from Red islet to Goose cape, is usually over 30 and sometimes over 50 fathoms in depth, and it affords no anchorage except those just described. Anchorage, however, might be obtained on the northwestern side of Hare Island bank, and on English bank, but only in fine weather could vessels ride in such exposed situations.

This want of good and convenient anchorages renders this part of North channel unsuitable for ordinary navigation, especially by sailing vessels.

In South channel, above Cacouna, there is anchorage almost everywhere; but in North channel, in a calm, a sailing vessel is carried by the strong tidal streams, and might be set on shore if in the vicinity of Red islet or the shoals off the Saguenay.

North channel is a fine, wide, and straight channel, free from detached shoals, but it should not be attempted with easterly winds and thick weather nor at night. The ebb streams setting down the St. Lawrence and out of the Saguenay, at the rate of about 6 knots, meeting the high swell sent up the estuary in northeasterly gales, causes a very heavy cross breaking sea, which it is difficult to distinguish from shoal water.

Directions.—If, however, the circumstances make it desirable to take North channel, when off Little Bergeron cove, bring White islet open its own breadth northward of Brandy Pots bearing 195° , and proceed southwestward with this range on. Prince Shoal light-vessel is a good guide.

Do not bring White islet to touch Brandy Pots, because this line passes nearly over the rocky patches eastward of Vaches shoal, on

which soundings of 7 fathoms have been obtained, but there may be less water. The southwestern half of Cacouna island open south-westward of Red islet, bearing 163° , leads eastward of these patches. There is no difficulty, when proceeding against the ebb stream, in passing northward and westward of the patches.

When Red Islet lighthouse bears 69° , or the red conical buoy on the southeastern extreme of Lark reef is abeam, steer directly up the middle of the channel between Hare island and the northern shore to Coudres island. In the event of the wind and tide failing, anchorage may be obtained on Hare Island bank, English bank, Murray bay, and westward of Goose cape. (For directions up North channel from Coudres island to Quebec, see page 466.)

Tidal streams—Red islet to South Traverse and Coudres island.—The direction of the tidal streams is indicated by arrows on the charts.

The principal flood stream ascends along the northern side of the estuary of the St. Lawrence. One part of this stream sets from below Bergeron coves toward and over the tail of Red Islet bank, curves round that bank to the southward, and then passes into North channel between Red islet and Hare Island North reef. At the same time a smaller flood stream ascends along the southern shore close outside Razade, Basque, Apple, and Green islands, and also inside them after the shoals are covered. When these two flood streams meet the last of the ebb, and afterwards each other, between Green island and Red islet, they cause high breaking rippings, which can be heard at some distance on a still night, and which appear like broken water on a shoal. Each of these two flood streams is strongest near its own side, and there is consequently little or no flood in mid-channel, particularly at neaps and with westerly winds.

Westward of Cacouna island the flood in South channel sets fairly up the river on either side of Barrett ledges, Middle shoal, and Middle bank, but its strongest part passes up the deep water north-westward of these shoals, between them and Brandy Pots and Hare island, where its rate is $2\frac{1}{2}$ to 3 knots at springs. On arriving at Hare Island bank, a great part of this stream passes between that bank and Hare island into North channel; the remainder runs over the tail of the bank back into South channel. The flood then sets fairly up South channel, and between Pilgrim islands and Hare Island bank, above which it becomes very weak, especially at neaps, until abreast Orignaux point, whence it gradually increases in strength, being aided by a branch of the northern stream setting between English and Hare Island banks, until it attains its greatest rate of $7\frac{1}{2}$ knots in South Traverse.

Another part of the principal flood stream passes between Red Islet bank and the shoals off the Saguenay, whilst a third part ascends that

river for a distance of 70 miles, or to the rapids. When the flood stream first makes, it meets the ebb stream down the channel northward of Hare island, and causes a tremendous rippling, extending from Lark reef to Red islet. Above Red islet, the principal flood stream, after sweeping round westward past bay of Rocks, pursues a tolerably fair course up North channel as high as cape Eagle, off which it divides again; the southern part proceeding southward of English bank, on its way to South Traverse; whilst the northern part passes between English bank and the north shore up to Goose cape.

Off Goose cape this northern part of the flood stream again divides; one, the lesser and weaker part, passing southward of Coudres island, throws off, at the first of the tide, branches to the southward, which pass over the western part of English bank, on either side of Middle ground, and between the latter and the shoals eastward of the reefs off Seal islands, into South channel. This seems to arise from the flood being earlier in North than in South channel, and hence the first of the flood for about 1 hour sets southward at South Traverse, and on Ste. Anne and St. Roch shoals. The other and principal part passes between Coudres island and the northern shore, where it attains a rate of 5 knots at springs.

Generally the direction of the ebb stream is always nearly the contrary to that of the flood, excepting between Red islet and Green island, and eastward of Red islet. The principal part of the ebb down North channel, being turned to the southeastward by Lark reef, comes through between Hare island, North reef, and Red islet, setting toward the northeastern end of Green island at a rate of 5 to 6 knots at springs. The ebb stream out of Saguenay river is equally strong, and sets toward the northern end of Red Islet bank, whence curving to the eastward, it unites with the St. Lawrence ebb, from which it can be readily distinguished by the dark color of its water, and both together set down the estuary, as has already been explained.

The flood and ebb are less unequal in duration in North than in South channel, and in both channels the flood and ebb streams, upon an average, continue $\frac{3}{4}$ and 1 hour, respectively, after high and low water on the shore.

The times of high and low water on the shore do not seem to be much affected by winds, but the amount of the tidal rise and fall, and the duration of the streams, are considerably affected by strong winds; nevertheless, as an approximation near enough for practical purposes, when the stream of flood makes in mid-channel the tide has risen on the shore at Brandy Pots $1\frac{1}{4}$ feet, and at South Traverse $2\frac{1}{2}$ feet; and when the ebb stream makes, the tide has fallen about 2 feet on the shore.

CHAPTER XII.

PROVINCE OF QUEBEC—ST. LAWRENCE RIVER, SOUTH, MIDDLE, AND NORTH CHANNELS TO QUEBEC.

VARIATION IN 1908.

St. Roch des Aulnaies----	19° 50' W.	Saut au Cochon-----	18° 50' W.
Quebec-----	17° 05' W.		

Note.—The St. Lawrence above Ouelle point on the east, and cape St. Joseph on the west, which were described in the last chapter, is divided into three channels by shoals and islands, and the navigation becomes very intricate. The eastern entrances of all three of these channels are rendered more or less difficult by their narrowness, the want of good anchorage in them, or the rate of the tidal streams.

South channel lies along the southern shore and between it and the shoals and islands occupying the central part of the river from South Traverse to Quebec. This channel, which is buoyed, is generally used for navigation; it is preferable to the others, having excellent anchorage, and moderate rates of the tidal streams in every part, except for a few miles in the Traverse. Vessels of heavy draft proceed by it to Quebec at all times of tide, but there is a depth of only 23 feet at low water over the bar at the southwestern end of Beaujeu channel, or that part of South channel which lies between Beaujeu bank and Crane island, and not more than 17 feet at low water southeastward of Beaujeu bank. Therefore, in this part of the channel, great caution must be used and great attention given to the tidal data.

Middle channel lies between the shoals and islands, which form the western side of South channel, and the long line of shoals and reefs which extend from Coudres island to Reaux island. In one part of it, near the eastern entrance of Middle Traverse there are not more than $2\frac{1}{2}$ fathoms at low water. Above this shallow part, there is room and water enough for vessels of heavy draft, until at the group of islands between Crane island and Orleans island, where Middle channel communicates with South channel by various narrow passages between the islands, in which there is plenty of water at all times, but very rapid tidal streams. Although, by placing buoys where requisite, it is possible to take large vessels up to Quebec by

Middle channel were it actually necessary to do so, yet it is too intricate and difficult for general navigation. This channel is, therefore, not further described in this book.

North channel runs along between the high northern shore of the river on the northwest and Coudres island and the line of shoals which extends from the latter to Neptune rock and Burnt Cape ledges on the southeast, and thence through North Traverse between the shoals which reach from Burnt Cape ledges nearly to Reaux island, and those which lie off the northeastern end of Orleans island. From North Traverse this channel continues between Reaux and Madame islands on the eastern side, and Orleans island on the western, till it unites with South channel opposite St. Vallier.

This channel was formerly in general use, but it is now little known to the majority of the pilots. It is broader than South channel, but the streams are much more rapid, and in the Narrows at its western end there is a depth of only 24 feet at low water.

Starting from Green island to Quebec, at the beginning of a fair tidal stream, a steamer with a speed of about 10 knots may, however, gain 1 hour in the passage by taking North rather than South channel.

The anchorage generally in North channel is not good, the bottom being foul from St. Paul bay southwestward to cape Maillard, and the tidal stream being very rapid. There is, however, anchorage on the western edge of the bank on the southeastern side of the channel, in a depth of about 10 fathoms.

Between Coudres island and the northern shore of the river, there is anchorage only in St. Paul bay and Prairie bay, both of which afford security in any weather; but with northerly winds heavy squalls come down from the north shore hills.

Above Coudres island to Brulé bank the channel is straight, $1\frac{1}{4}$ to $2\frac{1}{2}$ miles wide, and entirely clear. The depth of water is not inconveniently great, nowhere exceeding 18 fathoms at low water in mid-channel; but it is generally about 11 or 12 fathoms, shoaling toward the sides of the channel, where there is good anchorage out of the strength of the streams. There is, however, much more sea and tide in this long and open reach than in the corresponding parts of South channel; and in the fall of the year the northwesterly squalls off the mountains are heavy and frequent. Altogether, for general navigation, though South channel is preferable, North channel is good, and it frequently remains free from ice for some time after South channel becomes unnavigable in the fall of the year.

Orleans channel, between Orleans island and the northwestern shore of the St. Lawrence, is a good passage for small vessels, but is not available for those of heavy draft.

SOUTH CHANNEL, THE SOUTH TRAVERSE TO CRANE ISLAND.

The southern shore of the lower St. Lawrence from St. Roch point to St. Thomas, a distance of 24 miles, trends south-southwestward, is low, and composed of slate; inland it rises gradually in a series of ridges to a long wooded range, which is $4\frac{1}{4}$ to 6 miles distant from the river, and attains a height of 1,666 feet. The houses are almost continuous on this shore, with villages near the churches.

Supplies in small quantities, with the exception of coal, may generally be obtained at the villages.

St. Jean Port Joli.—The village of St. Jean Port Joli, at 7 miles south-southwestward of St. Roch des Aulnaies, contains a church which has a spire.

Pier.—There is a pier at St. Jean Port Joli 454 feet long, which has a depth of 5 feet at low water at its outer end.

The shore from St. Jean Port Joli continues south-southwestward, and at a distance of $2\frac{3}{4}$ miles is Port Joli, where there is a stream which admits small craft at half tide.

Railway and telegraph.—There are stations of the Intercolonial railway at about 1 mile inland from the villages of St. Jean Port Joli, L'Islet, St. Ignace, and St. Thomas. The railway stations are connected by telegraph with the universal system.

Trois Saumons river, 1 mile south-southwestward of Port Joli, has a large sawmill near its mouth; the river admits small craft at about half tide.

L'Islet village is situated $2\frac{3}{4}$ miles southwestward of the entrance of Trois Saumons river; its church has two spires. At 1 mile northeastward of L'Islet church, and about 2.2 miles from Trois Saumons river, there is a conspicuous cross on a cliff 59 feet high.

Signal station.—The telegraph and signal station at L'Islet is situated 300 yards northeastward of the church, and close westward of the convent, which is a square stone building surmounted by a turret.

Pier—Beacon.—The pier at L'Islet is 1,105 feet long, with a depth of 8 feet at low water close to its outer end; a black frame beacon stands on the end of this pier.

The shore from L'Islet trends southwestward for nearly $5\frac{1}{2}$ miles to a point on which there is a disused mill, whence there is a bight about $1\frac{1}{4}$ miles across to cape St. Ignace. This bight dries at low water.

St. Eugène church, at about 3 miles southward of L'Islet, has a spire.

There is a small pier, which dries at about half tide, at anse à Giles, $3\frac{1}{2}$ miles southwestward of L'Islet.

Cape St. Ignace is a conical mound 52 feet high covered with small bushes. There is a wharf on the eastern side of the cape, but it can be approached only at or near high water.

St. Ignace village is about $\frac{3}{4}$ mile inland from the cape; its church has a spire.

The shore from cape St. Ignace trends southwestward $4\frac{1}{2}$ miles to a channel through which the united rivers Bras St. Nicholas, flowing from the eastward, and rivière du Sud, from the southwestward, discharge their waters. The combined streams fall in a cascade about 30 feet high to a small bight, called the basin, at $\frac{1}{4}$ mile within St. Thomas pier.

There is a small pier at $1\frac{1}{4}$ miles southwestward of cape St. Ignace, but it dries at about half tide.

St. Thomas de Montmagny village is on both banks of rivière du Sud at $\frac{1}{2}$ mile within the entrance; its church has one spire.

The village, which has a population of 1,919 inhabitants, contains a sawmill, a pulp mill, two foundries, and iron works. Important ship-pings of lumber are made to European markets.

St. Thomas pier, 205 feet long, at the western entrance point of rivière du Sud, has a depth of 4 feet at its end at low water.

The channel from St. Thomas pier and basin through St. Thomas bank to the river St. Lawrence trends northeastward in one bend and is marked by buoys, but it nearly dries at low water.

Bank.—A bank which dries at low water extends $\frac{1}{4}$ mile off cape St. Ignace, and continues along the shore to the southwestward, attaining a distance of 1 mile offshore at $\frac{1}{2}$ mile eastward of the river entrance. St. Thomas bank is a continuation of this bank. (See p. 475.)

The high-water bank near St. Thomas is receding, and each year more is broken away by ice and sea; the low-water line, however, is not changing much.

Lights.—A white open framework tower 26 feet high at the outer end of St. Thomas pier at the western entrance of the rivière du Sud, exhibits at 26 feet above high water a fixed red light that should be seen in clear weather a distance of 3 miles.

A white framework tower 36 feet high, situated 164° , 657 yards from the preceding light, exhibits at 44 feet above high water a fixed red light that should be seen, through a small arc on each side of the range line, in clear weather a distance of 3 miles.

These lights are leading lights for entering the harbor only, which should not be attempted without local knowledge.

The shore from St. Thomas pier continues southwestward for 3 miles to St. Thomas point, which is low. St. Thomas bank. (See p. 475.)

St. Roch shoals join those of Ste. Anne and continue southwestward at a considerable distance from the shore from St. Roch to St. Thomas.

South Traverse is a channel 450 yards wide at its narrowest part, between St. Roch shoals on the east and Middle ground with the shoals between it and Goose island on the west.

Lights—Lower Traverse lighthouse, a brown cylindrical tower surmounting a rectangular building on a concrete base, altogether 50 feet high, situated on the northern end of St. Roch shoals, with Upper Traverse lighthouse bearing 206° , distant 1.6 miles, exhibits, at 55 feet above high water, a flashing white light, thus: Light, 1 second; eclipse, 4 seconds, which should be seen, in clear weather, a distance of 13 miles.

Fog signal.—A diaphone trumpet at the lighthouse gives 1 blast of 3 seconds' duration every minute, thus: Blast, 3 seconds; interval, 57 seconds, during thick and foggy weather. The trumpet, which is worked by compressed air, projects from the northern side of the lighthouse and is 20 feet above high water.

Upper Traverse lighthouse, a square white building with a red roof, above which rises a square white tower with a red lantern, the height of the lighthouse being 42 feet, situated on a concrete base on the northwestern edge of St. Roch shoals with St. Roch church bearing 107° , distant 3.9 miles, exhibits at 47 feet above high water a fixed white light, which should be seen in clear weather a distance of 12 miles.

Fog signal.—A bell is sounded by hand at short intervals during thick weather, fog, or snow storms.

Middle ground forms the northwestern side of the northeastern part of South Traverse channel.

Middle ground lightbuoy.—The northeastern end of the shoal is marked by a cylindrical red lightbuoy, No. 56B, moored in 31 feet, which exhibits an intermittent white light every 7 seconds, thus: Light 4 seconds, eclipsed 3 seconds, visible 8 miles.

South Traverse Middle ground lightbuoy.—The southeastern edge of the shoal is marked by a red cylindrical lightbuoy, No. 58B, situated north-northeastward of Lower Traverse lighthouse, and it exhibits an intermittent white light every 10 seconds, thus: Light 7 seconds, eclipsed 3 seconds, visible 8 miles.

Upper Traverse lightbuoy.—The southwestern end of the shoal is marked, at 900 yards 291° from Upper Traverse lighthouse, by a red cylindrical lightbuoy, No. 60B, which exhibits an intermittent white light every 13 seconds, thus: Light 7 seconds, eclipsed 6 seconds, visible 8 miles.

St. Roch shoals—Buoys.—A black can buoy, No. 61B, is moored westward of St. Roch shoals with Upper Traverse lighthouse bearing 22° , distant 3.2 miles, nearly.

A black can buoy, No. 63B, is moored westward of St. Roch shoals with St. Jean Port Joli church bearing 144° , distant $2\frac{3}{4}$ miles.

Channel patch is a narrow ridge directly in the way of vessels using South channel, extending about a mile north-northeastward and south-southwestward, with depths of 21 to 25 feet water over it. From the shoalest part of the patch, which is about 400 yards from its southwestern end, Stone Pillar bears 213° , distant 2.6 miles. The passage westward of Channel patch must not be used for navigation.

Lightbuoy.—The shoalest part of the patch is marked by a bell and light buoy, No. 64B, painted red and black in horizontal stripes, and showing an intermittent white light, eclipsed every 6 seconds. This buoy alters its position about 200 yards with the tidal streams.

Shoals.—Several shoals with depths of 15 to 21 feet over them lie between Channel patch and Stone Pillar; the highest part of Goose Island reef just open southward of Stone Pillar, bearing 218° , leads southeastward of them.

The northern edge of the shoal ground off St. Jean Port Joli is distant only $\frac{1}{2}$ mile southeastward of Channel patch, and here there are two 19-foot shoals, with 8 fathoms at 300 yards northwestward of them.

Port Joli shoal—Lightbuoy.—A cylindrical black lightbuoy, No. 65B, is moored in 5 fathoms on the western side of the northern of two $2\frac{3}{4}$ -fathom patches off Port Joli, with Stone Pillar light bearing 253° , distant a little more than 1 mile, and it exhibits an intermittent white light every 12 seconds, thus: Light 7 seconds, eclipsed 5 seconds, visible 8 miles.

Seal islands, situated in the middle of the river and northwestward, 6 miles from Port Joli, are three islets, each about 6 feet high, and the highest parts of a long slate reef which is covered at high water. There are three houses on the eastern islet, with a cross and two high bushes near them; on the western islet is a conspicuous spruce tree surrounded by low bushes. The reef is surrounded by shoal water.

The Pillars are two small and steep islets of graywacke rock named Wood Pillar and Stone Pillar.

Wood Pillar, 289° , $3\frac{3}{4}$ miles from Port Joli, is 600 yards long and 81 feet above high water. There is a beacon on this islet which is partly obscured by trees, and can be seen only from a short distance. **Middle rock**, 900 yards, 60° from Wood Pillar, to which it is connected by a shoal, dries 17 feet at low water. A shoal which extends $2\frac{1}{2}$

miles northeastward from Wood Pillar continues from it southwestward to the northeastern point of Goose island.

Stone Pillar, $1\frac{1}{2}$ miles eastward from Wood Pillar, is quite bare. (See p. 470.) Shoals between Stone Pillar and Channel Patch.

Light.—A circular, gray stone lighthouse, with a red lantern, 52 feet high, at about 100 yards from the southern point of Stone Pillar, exhibits, at 75 feet above high water, a revolving white light, which attains its greatest brilliancy every $\frac{1}{2}$ minute, and should be seen, in clear weather, a distance of 13 miles.

There is a white dwelling with a brown roof near the lighthouse.

Algernon, or South, rock, which covers at half tide, is steep-to on all sides but the northeastern, from which shoal water extends 300 yards to a depth of 18 feet. A rock, with a depth of 18 feet over it, is situated 34° , distant 700 yards; and a shoal with 26 feet water 37° $\frac{3}{4}$ mile, respectively, from Algernon rock.

Light.—A square white lighthouse, with a red roof, 32 feet high, built on a cribwork pier on Algernon rock, exhibits, at 36 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 6 miles.

Leading marks.—The highest part of Goose Island reef just open southward of Algernon Rock lighthouse, bearing 223° , leads southward of the shoals northeastward of Algernon rock; and the whole of Crane island well open southward of Goose Island reef, bearing 227° , leads southward of Algernon rock and of the shoals between it and Goose Island reef.

Goose Island reef, 2.3 miles southwestward of Stone Pillar, consists of a ledge of rock, 1.7 miles in length, and trending southwestward with the river. Several small heads of the reef are above water at all times of tide; the highest part, a rugged conical mound, 29 feet high, is situated near the southwestern part of the reef. An isolated rock, which dries 2 feet at low water, lies nearly $\frac{1}{2}$ mile 38° from the northeastern end of the reef; it is connected with the reef by shoal water, and a 3-fathom patch lies 400 yards southeastward of it. There are four other shoal spots between Stone Pillar and Goose Island reef, with depths of 11 to 16 feet over them. Several small detached rocks lie off the southeastern side of Goose Island reef, but they do not extend more than 200 yards from it; a rock with a depth of 8 feet is situated midway between the southwestern end of Goose Island reef and Goose island.

A long spit, with depths of 9 to 17 feet over it, extends nearly $1\frac{1}{2}$ miles from the southwestern end of Goose Island reef.

Leading mark.—Stone Pillar lighthouse, open southeastward of the highest part of Goose Island reef, bearing 36° , leads southeast-

ward of this spit, and the deepest water in the channel is about 800 yards southeastward of Goose Island reef and the spit.

Goose island, the main part of which is 2.8 miles long northeast and southwest, with a greatest width of a little more than $\frac{1}{2}$ mile, is composed of wooded, hilly ground, divided by a valley into northern and southern ranges; near its southwestern extreme are two round summits, 203 feet high. A chain of hillocks, that from a distance appear like islands, and on which are several conspicuous houses, with barns near, extends southwestward from the northern range. This range, which is 168 feet high, falls in cliffy banks, and at its northeastern end is a large white barn, which is very conspicuous from the northward. A large red sugar-loaf beacon stands on a small detached islet close southward of the northeastern end of Goose island.

Goose Island meadows (*battures de l'île aux Oies*) extend $4\frac{1}{2}$ miles southwestward from the southwestern end of Goose island and connect it with Crane island; the meadows are only just above high water ordinary springs, and are intersected by numerous streams that have cut deep channels in the mud, and are impassable from half flood to half ebb.

These meadows yield a large quantity of coarse hay, which is divided among the inhabitants of Goose and Crane islands, who export the hay to Quebec and to the villages on the shores of the St. Lawrence. After the harvest the meadows are covered with haystacks, which are erected on framework to prevent the loss that would otherwise be occasioned by exceptionally high tides, and from a distance these stacks resemble small houses.

Several rocks lie off the southeastern coast of Goose island, all of which cover at high water, except *rocher aux Grêlons*, which is 4 feet above high water and situated about 192° , $\frac{1}{2}$ mile from the highest part of the island and on the outer edge of the reef that dries at low water, and Hospital rock, which is 10 feet high, and situated $\frac{1}{2}$ mile 241° from *rocher aux Grêlons*. Chapel rock, 24 feet high, is on the meadows at 279° , 900 yards from Hospital rock, and is named from a church which formerly stood there, the foundations of which still exist.

Beacon.—A white diamond-shaped beacon, about 30 feet high, stands on the southern coast of Goose Island meadows at a little more than 2 miles southwestward of Hospital rock.

Vessels could be laid on shore in case of necessity, for instance, to winter safe from the ice, in that part of the bay between Goose and Crane islands which is included between distances of $\frac{1}{2}$ mile and 2 miles southwestward of Hospital rock, where the bottom is mud, dry at low water. There are but few places fit for this purpose in the St. Lawrence.

Dunscomb rock, 168° , 1,600 yards from Hospital rock, has 14 feet water over it, with 5 fathoms close-to. From the rock the summit of cape Tourmente is in line with the summit of Onion island, bearing 263° , and the northwestern side of Wood Pillar is in line with the southeastern extreme of the rocks southeastward of Goose island.

Shoal.—From Dunscomb rock the edge of the shoal water extending off Goose Island meadows trends southwestward to about $\frac{1}{4}$ mile off Macpherson point, the northeastern point of Crane island.

Buoy.—A red conical buoy, No. 68B, is moored on the edge of this shoal at 42° , $1\frac{3}{4}$ miles from Macpherson point.

Crane island is about 3.3 miles long, northeast and southwest, $\frac{3}{4}$ mile wide, and is generally flat in outline, its greatest height being 132 feet, near its southwestern end. The lower parts of the land are cultivated, but the summit and southwestern slope are wooded. A house and the barns near it, at the northeastern extreme of the island, are conspicuous; there are numerous beacons on its southeastern side; and on its northwestern side there is an almost continuous line of houses, with St. Antoine church, built of brick and surmounted by a spire, in the middle of them.

The population of the island is about 750; and the inhabitants, who all live on its northwestern side, are engaged chiefly in farming.

Piers.—A pier on the southeastern side of Crane island is 639 feet long, with a depth of 4 feet water at its outer end at low water springs.

In 1902 a pier was constructed on the northwestern side of the island; it is 730 feet long, with a depth of 14 feet at its end at high-water neaps. This pier is meant to facilitate the shipping of the farm produce from the island.

Light.—An octagonal white lighthouse, with a red lantern, 48 feet high, at the end of the pier on the southeastern side of Crane island, about 1.2 miles eastward of point aux Pins, the southwestern point of Crane island, exhibits, at 48 feet above high water, an intermittent white light, every 15 seconds, showing thus—light, 10 seconds, eclipse 5 seconds, that should be seen, in clear weather, a distance of 12 miles.

Beaujeu bank, the northern end of which lies 186° , 2.2 miles nearly from Hospital rock, is a narrow shoal of sand and gravel over slate, extending southwestward about 2 miles, with only 10 feet at low water over some parts of it. Its southwestern end approaches to within $\frac{3}{4}$ mile of Crane island.

Lightbuoys.—A cylindrical light and bell buoy, surmounted by a steel frame supporting a bell and lantern, No. 67B, painted red and black in horizontal stripes, and showing an intermittent white light,

is moored off the northeastern extreme of Beaujeu bank, with L'Islet church bearing 68° , distant 4 miles.

A similar buoy, No. 69B, painted red and black in horizontal stripes, and showing an intermittent white light, is moored with Crane Island lighthouse bearing 227° , distant 2 miles.

Beacons.—On the coast of Crane island at about 600 yards southwestward of Macpherson point are two diamond-shaped beacons, which in line 286° lead to lightbuoy No. 69B. at the southwestern end of Beaujeu bank.

Light.—A red steel tower surmounting a square stone beacon situated on the shoals at 146° , 600 yards from the southeastern of the beacons marking lightbuoy No. 69B, shows an unwatched intermittent white light, elevated 27 feet above high water, which should be seen from a distance of 10 miles. This light in line with Crane Island Pier light, bearing 223° , leads through Beaujeu channel from Goose Island reef to West Narrows passage.

Shoals.—Southwestward of the diamond-shaped beacons Crane Island shoals extend 600 yards offshore. This distance decreases to 300 yards at Crane Island light.

Buoy.—A red buoy, No. 70B, is moored in 24 feet on the southeastern extreme of Crane Island south shoal at 244° nearly 400 yards from lightbuoy No. 69B, at the southwestern end of Beaujeu bank.

Beaujeu channel, between Beaujeu bank and the shoals off Goose Island meadows, is about $\frac{1}{2}$ mile wide, and has depths of 6 to 9 fathoms; but West Narrows passage, between the southwestern end of Beaujeu bank and the shoals off Crane island, is a bar only 300 yards wide and 23 to 36 feet deep.

Beacons—Prohibited anchorage.—On Macpherson point, the northeastern point of Crane island, are two white sugar-loaf beacons, bearing 284° and 104° from each other; and on the coast of the island about 1 mile farther southwestward are two white sugar-loaf beacons on a similar bearing. These pairs of beacons, each in line, mark a space within which anchorage is prohibited, as it is necessary that the lighthouse and buoys may be easily made out in order to cross the bar at the head of Beaujeu bank safely.

Channel southeastward of Beaujeu bank.—The depth in this channel is irregular, varying from 5 fathoms to 17 feet, and there is one rocky patch of 17 feet that is difficult to avoid, so that, as the channel is not buoyed, only that depth could be depended on to be carried through at low water springs, although perhaps with local knowledge a least depth of $3\frac{1}{4}$ fathoms might be obtained. The channel is $\frac{1}{2}$ to $\frac{3}{4}$ mile wide.

Buoy.—A black can buoy, No. 75B, is moored northward of a 16-foot shoal on the southern side of the channel, with Crane Island

lighthouse bearing 356°, distant nearly $\frac{3}{4}$ mile. Two sugarloaf-shaped beacons situated at the southwestern end of Crane island are cross marks for this buoy.

Submarine cable.—Just eastward of this buoy a submarine cable passes from the western side of Crane Island wharf to a point on the southern shore of the river, halfway between the village of St. Thomas de Montmagny and Methot’s wharf.

A large sign warning vessels not to anchor in the vicinity is placed on Crane Island wharf.

St. Thomas bank extends rather more than 2 miles northward and also westward offshore at the village of St. Thomas; it is composed of sand, mud, and stones, and dries at low water nearly to its northern edge, which is very steep. Boulders are visible at low water beyond the northeastern extreme of that part of the bank which dries.

Lightbuoy.—A black spherical lightbuoy, No. 77B, which shows an intermittent white light, thus, light 8 seconds, eclipse 7 seconds, is moored on the northern extreme of the bank, in 5 fathoms, with Haystack island in line with the western extreme of Crane island, and the red sugar-loaf beacon in line with the white diamond beacon on the southern side of Crane island.

Clearing marks.—The southeastern end of Bellechasse island and St. Vallier point in line leads northward of St. Thomas bank; therefore the whole of the island should not be opened northward of the point, but this mark can seldom be seen. The apparent northern extreme of the range of hills on the southern shore just open southward of Crane Island lighthouse, bearing 51°, leads northward of St. Thomas bank in the deepest water.

Tides and tidal streams.—The rise and fall of the tide at St. Roch des Aulnaies, for every hour after low and high water, is given in the following table, and from it the depth of water at any time, over any shallow part of the river in this vicinity, may be easily deduced.

Height of the tide every hour after low and high water ordinary spring tides:

Place.	After low water.		Flood tide.	After high water.		Ebb tide.
	<i>h.</i>	<i>m.</i>	<i>Ft. in.</i>	<i>h.</i>	<i>m.</i>	<i>Ft. in.</i>
At St. Roch des Aulnaies.....	0	0	0 0	0	0	17 0
	1	0	2 6	1	0	14 9
	2	0	5 3	2	0	11 9
	3	0	9 6	3	0	8 6
	4	0	13 6	4	0	5 6
	5	0	16 3	5	0	3 0
	5	35	17 0	6 0		1 6
				6 50		0 0

At neap tides, the rise and fall not being so great as at ordinary springs, the proportionate part of the rise and fall for every hour is also less, and an allowance must be made accordingly.

In the Lower Traverse the flood stream begins 6h. 0m. after high water at Quebec, and it runs 5h. 45m.; the ebb stream begins 0h. 45m. before high water at Quebec, and it runs 6h. 45m.

In the Upper Traverse the flood stream begins 6h. 0m. after high water at Québec, and it runs 5h. 25m.; the ebb stream begins 1h. 0m. before high water at Quebec, and it runs 7h. 0m.

The times of these changes, however, vary considerably.

The flood stream begins much earlier in North channel than in South, and the first of the stream therefore comes from the northward, setting southward upon Ste. Anne and St. Roch shoals, but inclining gradually more to the westward, until at a quarter-flood it sets south-southwestward fairly through South Traverse. After half flood it sets southwestward and toward the end of the tide still more to the westward; perhaps this is because, the time of high water being somewhat earlier in North channel, the water has begun to fall there before the flood has quite ceased in South channel.

The ebb stream sets nearly in the contrary direction to the flood, the first of the ebb setting off from Ste. Anne and St. Roch shoals through the channels westward of Middle ground, and northward over the tail of that shoal.

Above the Pillars both streams set fairly up and down the river.

It is high water, full and change, at l'Islet at 5h. 11m.; springs rise 18 feet, neaps 13 feet. The flood stream in the offing begins at 0h. 30m. after low water on the shore, or 6h. 0m. after high water at Quebec, and it runs 5h. 30m.; the ebb stream begins at 0h. 30m. after high water on the shore, or 0h. 57m. before high water at Quebec, and it runs 6h. 50m.

It is high water, full and change, at West narrows, Beaujeu channel, at 5h. 24m.; springs rise $18\frac{1}{2}$ feet, neaps 13 feet; neaps range 11 feet.

Rates.—In South Traverse, below about a mile above Upper Traverse lighthouse, the rate of the ebb is 7 to 8 knots, and that of the flood 6 to $7\frac{1}{2}$ knots. The rates of the flood and ebb streams decrease gradually westward until about $1\frac{1}{2}$ miles below Channel patch, where the ebb stream attains a rate of $4\frac{1}{2}$ knots at springs; the rate of this stream increases to $5\frac{1}{4}$ knots southward of the Pillars, and decreases to 3 knots at Crane island, while the flood stream runs about 1 knot an hour less at the respective localities.

Caution.—Attention must be given to the rate and height of the tides between Green island and Quebec. Vessels of heavy draft must of course be taken over the shoal spots at the proper stage of the tide.

Directions for South Traverse.—In bad and thick weather great consideration is necessary as to running through South Traverse, especially at night, and in ships of much draft. It is generally desirable for steamers coming up the river to pass South Traverse with the flood, for the ebb is so rapid between the buoys that, except in a vessel with great speed, little progress will be made against it.

In approaching South Traverse from the eastward, when nearing Middle Ground lightbuoy, haul to the southward, leaving the buoy $\frac{1}{2}$ mile to the westward, and keep cape Diable well open of Orignaux Point lighthouse, bearing 56° , until Lower Traverse lighthouse is in line with Upper Traverse lighthouse, bearing 205° , or Upper Traverse lighthouse is in line with Stone Pillar lighthouse, bearing 205° , and enter the Traverse with either of these marks on. The first of the flood stream sets southward toward St. Roch shoals, and the ebb in the contrary direction.

When about $1\frac{1}{2}$ miles below Lower Traverse lighthouse steer so as to leave South Traverse Middle Ground lightbuoy on the starboard hand, and pass 300 yards westward of Lower Traverse lighthouse, about 400 yards westward of Upper Traverse lighthouse, and about 400 yards eastward of Upper Traverse lightbuoy. Thence steer about 199° to leave Channel Patch lightbuoy 400 yards on the starboard hand and the two black buoys on the western edge of St. Roch shoals on the port hand. The courses alone must not be trusted, for the set of the streams can not be determined exactly; but the lead, buoys, and lighthouses are the only sure guide; therefore courses are not given.

Do not close the shoals on the western side of the channel which extend southward and southwestward from Upper Traverse through South Traverse. From eastward of Channel Patch lightbuoy steer to pass 400 yards westward of St. Jean Port Joli black lightbuoy, and then a similar distance eastward of Algernon rock. After passing Algernon rock keep Crane Island well open southward of Goose Island reef, bearing 226° , to clear the shoals between them, and open that mark gradually so as to pass 800 yards southeastward of Goose Island reef.

Beaujeu channel.—When Hospital rock bears 308° , gradually bring Stone Pillar lighthouse just open southward of the southern extreme of the highest part of Goose Island reef, bearing 37° , and keep that range on astern, passing 600 yards northwestward of the lightbuoy off the northeastern end of Beaujeu bank, through the fairway of Beaujeu channel, and direct to the lightbuoy on the southwestern end of Beaujeu bank. In passing leave the red buoy off Goose Island meadows 500 yards to the northwestward. It may be more convenient to use the range of Beaujeu Channel light and

Crane Island Pier light. In this case pick up that range as soon as possible after passing Algernon rock, and keep it on 223° until the lightbuoy at the southwestern end of Beaujeu bank is about $\frac{1}{2}$ mile ahead. In either case leave the lightbuoy 100 yards on the port hand, and pass between that buoy and the red buoy to the southwestward, with the beacon on Goose Island meadows in line with the middle of la Grosse montagne (the western hill of Goose island), bearing 8° . When Channel rock, situated 350 yards northeastward of Macpherson point and which dries 9 feet at low water, is visible, the beacon should be its own height open eastward of this rock when the above range is on. Keep the range on until the southwestern prohibited anchorage beacons are in line, or Crane Island lighthouse bears 236° , then steer to pass $\frac{1}{4}$ mile southeastward of that lighthouse. (For continuation, see p. 491.)

To pass southeastward of Beaujeu bank, where the depth is not more than 17 feet at low water, when $1\frac{1}{2}$ miles southwestward of Goose Island reef, bring Stone Pillar its own breadth open southeastward of Goose Island reef, bearing 32° , and keep this range on astern, steering 400 yards southeastward of the northeastern lightbuoy of Beaujeu bank. From southeastward of this buoy continue 212° , until St. Vallier point is open southward of Crane Island lighthouse, bearing 232° , when steer for St. Vallier point; this course leads about 800 yards southward of the southwestern lightbuoy of Beaujeu bank. Having reached this position, keep away to the southward and run along the southeastern coast of Crane island at about 600 yards distance, passing $\frac{1}{4}$ mile southeastward of Crane Island lighthouse, and the same distance northwestward of the black buoy on the patch lying nearly $\frac{3}{4}$ mile from Crane Island lighthouse.

Caution.—The South Traverse should not be attempted at night, except with a pilot.

Anchorage in South Traverse.—There is anchorage off Ste. Anne shoals in 6 fathoms at low water up to within $1\frac{1}{2}$ miles from Lower Traverse lighthouse, where the ground is better, and the tidal stream is less than on the tail of Middle ground; but the latter is the better position for a sailing vessel for weighing with the first of the flood in northerly winds. Anchorage has been obtained for one tide, in fine weather, on the edge of St. Roch shoals, between Traverse lighthouses; but this position is not recommended, for the ebb stream runs there at the rate of 8 knots, and the ground is not to be depended on; hence, if the anchor once started it would be difficult to bring the ship up again, and there would be great danger of losing the anchor. In a sailing vessel, should the wind fail, or the flood be done, if an anchorage about 2 miles above Upper Traverse lighthouse can not be gained, it is advisable to run down below Lower Traverse lighthouse.

Anchorage off St. Roch shoals is indifferent until above St. Jean Port Joli church, but along the edge of the bank off the southern shore, from southeastward of the Pillars to Crane island, the holding ground is a stiff clay, and so good that it is sometimes difficult to weigh an anchor. There is excellent anchorage in westerly winds off Crane island at 1 mile above Beaujeu bank in 6 fathoms at low water, and there is equally good anchorage with easterly winds under the western end of the island in 5 fathoms. Outward-bound sailing vessels meeting a strong easterly wind anywhere above Upper Traverse lighthouse should run back to this anchorage.

SOUTH CHANNEL, ABOVE CRANE ISLAND—SOUTH SHORE, FROM ST. THOMAS POINT TO POINT LEVIS.

St. Thomas point, 3 miles west of the entrance of the rivière du Sud, is low. (See p. 468.)

Wye rock, about 3 miles northward of St. Thomas point, is about 400 yards long, northeast and southwest, and 100 yards broad, with a depth of 1 foot over it at low water. It is separated from St. Thomas bank by a channel nearly $\frac{1}{2}$ mile wide, but with depths greater than 3 fathoms, only 200 yards wide.

Buoy.—A black can buoy, No. 79B, is moored in $5\frac{1}{2}$ fathoms, northwestward of Wye rock, with St. Thomas point bearing 166° , distant a little more than $\frac{3}{4}$ mile.

Leading marks.—The apparent northern extreme of the range of hills on the southern shore just open southward of Crane Island lighthouse 51° , leads in the deepest water in South channel, northward of Wye rock; the chapel near the summit of cape Tourmente, on the northern shore of the river, in line with the flagstaff on Grosse isle, bearing 321° , leads northeastward of Wye rock in 15 feet water; and the same chapel, in line with the western pier on Grosse isle, bearing 325° , leads westward of that rock. The Seminaire, on the northern shore of the river at about $2\frac{3}{4}$ miles southwestward of cape Tourmente, is rarely visible from South channel, except when the sun is shining on it.

The south shore from St. Thomas point trends southwestward for $4\frac{1}{2}$ miles; it then turns northwestward for $\frac{1}{2}$ mile to Berthier East point. From this point it continues southwestward $1\frac{1}{2}$ miles to point Rouge.

Trou de Berthier is $\frac{1}{2}$ mile westward of Berthier East point. Berthier village, which has 1,364 inhabitants, is situated about $\frac{1}{4}$ mile southward of the trou, and its church has a single spire. There is a pier at point Verte, the eastern entrance point of the trou, with a depth of 14 feet close to its outer end at low water.

There is a large traffic in farm produce here, and a coasting steamer plies daily during the season between Berthier and Quebec.

Rocks.—Two rocks 300 yards apart, and with depths of 1 foot and 6 feet over them, lie 800 yards offshore between Berthier East point and Berthier pier. These rocks are heads of a narrow ledge with depths of 9 to 17 feet over it, running parallel to the shore, and with its northeastern extreme bearing 339° 800 yards from Berthier East point. Bellechasse light, bearing southward of 235° , leads northward of the above shoal water.

Tides and tidal streams.—It is high water, full and change, at Berthier at 5h. 40m.; springs rise $17\frac{1}{2}$ feet, neaps 14 feet. The flood stream in the offing begins at 1h. 10m. after low water on the shore, or 4h. 40m. before high water at Quebec, and it runs for 5h. 5m. The ebb stream begins at 1h. 5m. after high water on the shore, or 0h. 25m. after high water at Quebec, and it runs for 7h. 20m.

Bellechasse island, the eastern end of which bears 315° , distant nearly $\frac{3}{4}$ mile from point Rouge, comprises three principal and several small rocks joined together at low water; it is 600 yards long, northeast and southwest, and narrow. There are not more than 3 fathoms water in the channel between it and the main.

Light.—A square, white lighthouse, 40 feet high, with a red roof and a dwelling attached, on the eastern summit of Bellechasse island, exhibits, at 54 feet above high water, an intermittent white light every 17 seconds—showing thus: Light, 10 seconds; eclipse, 7 seconds—that should be seen in clear weather a distance of 12 miles.

Pointed rock, 250 yards northeastward of the middle of the island, has 6 feet water over it. A rock that dries 2 feet at low water lies 200 yards southwestward, and a shoal with 12 feet over it lies westward 400 yards from the southwestern end of Bellechasse island.

Anse de Berthier, lying between point Rouge and St. Vallier point, 270° , 1.7 miles, is about 1 mile from entrance to head, but it is nearly all dry at low water.

St. Vallier point is the end of a wooded bluff 128 feet high, and it is the first prominent point on the southern shore westward of the Traverses.

Shoal.—A shoal with 15 feet water over it lies 16° , $\frac{1}{2}$ mile from St. Vallier point.

The shore from St. Vallier point trends southwestward 2.6 miles; it then turns westward, with two projecting points, for 2 miles to point St. Michel.

St. Vallier village and church stand on the shore at about 2 miles southwestward of St. Vallier point. There is a beacon on the shore

northward of the church, and in line with the latter leads to the buoy off Madame reef.

St. Vallier bank fills the whole bay between St. Vallier and St. Michel points, and extends nearly $\frac{3}{4}$ mile north-northeastward of St. Michel point.

A rock, with 12 feet water on it, lies nearly $1\frac{1}{2}$ miles westward from St. Vallier point.

Leading marks.—The end of the pier at point Verte shut in with the southwestern end of Bellechasse island, bearing about 74° , leads northward, and Beaumont church, open northward of point Durantaye, bearing about 232° , leads northwestward of these shoals.

St. Michel point is low. Reefs of slate extend eastward of it, with shoal water in continuation, but there is deep water at $\frac{1}{4}$ mile northward of the reefs.

St. Michel village is about $1\frac{1}{2}$ miles southwestward of the point, and has a church with a spire. The chapel of Notre Dame de Lourdes, on a wooded bluff close westward of the village, has a fine spire. The site of the village is picturesque, and it is somewhat frequented as a summer resort. A pier, 1,100 feet long, which is almost dry at low water, extends from the shore near the village; several rocks lie off the end of the pier, but a channel appears to have been dredged to it. A coasting steamer calls here twice daily for the traffic in farm produce from the surrounding country.

The shore from St. Michel village trends about westward nearly 1 mile to point Durantaye, and thence approximately southwestward $4\frac{1}{4}$ miles to Beaumont church, which has a spire, and stands on a cliff. A waterfall runs over the cliff at 1 mile westward of the church and close to a ruined mill at the base. Westward of this mill the water is deep close to the low water line, which, however, is 400 yards from the high water mark.

Beaumont reefs lie off Beaumont village and comprise a line of boulders, the eastern end of which dries 4 feet at low water, and numerous boulders extending, at Beaumont, 800 yards from the shore, but gradually closing point Durantaye.

Lightbuoy.—A black can lightbuoy, with an open conical top-mark, No. 87B, is moored in 18 feet water close northward of the eastern part of the reef, about $\frac{3}{4}$ mile from the southern shore, and 168° nearly $\frac{3}{4}$ mile from St. Laurent lighthouse. It exhibits, at 9 feet above the water, an intermittent white light.

Leading mark.—St. Joseph de Lauzon church well open of Martinière point, bearing 258° , leads northward of Beaumont reefs.

Martinière point, westward 4.3 miles from Beaumont, is the base of a small wooded hillock. A diamond-shaped beacon stands close to the point.

The shore from point Martinière trends westward for $2\frac{1}{4}$ miles and then southwestward 1 mile to point Levis.

Lauzon village, which has 3,416 inhabitants, is situated about a mile below point Levis. St. Joseph church, in the village, is a conspicuous building with a spire, and close to it are a large college and convent, each surmounted by a statue.

Bienville village, within point Levis, contained 851 inhabitants in 1901.

Point Levis shoal is formed by irregular soundings within the 10-fathom line, which from 400 yards off Martinière point trends westward for $1\frac{3}{4}$ miles, when it turns toward point Levis. In a northeasterly direction from St. Joseph church there is a depth of 24 feet at $\frac{1}{2}$ mile offshore, and westward of this position shoal water continues, gradually closing point Levis. Westward of the shoal, point Levis is steep-to.

Lightbuoy.—A black cylindrical lightbuoy, No. 89B, is moored on the edge of Point Levis shoal, with the flagstaff at Levis Dock Landing stage bearing 104° distant 275 yards. The buoy exhibits an intermittent white light.

Leading marks.—A small fall in the land, 1 mile westward of Durantaye point in line with the southern extreme of Orleans island, bearing 80° , leads northward; and the spire of St. John church at Quebec, in line with the southwestern end of the Immigration offices on Commissioners' wharf, bearing 236° , also leads northward of this shoal. (See also p. 489.)

SOUTH CHANNEL, ABOVE CRANE ISLAND—ISLANDS AND SHOALS FORMING ITS NORTHERN SIDE.

The islands in order westward and southwestward of Crane island (île aux Grues) are Haystack (île Ronde), Mill (île aux Chevaux), Race (île Longue), Margaret, Cliff (île à Sottise) islands, and Grosse isle. The highest of all these is Grosse isle, which rises 214 feet above high water.

Between these islands there are narrow and intricate passes, leading into Middle Traverse, with water enough for vessels of heavy draft, but they are little used for navigation and the chart is the guide to them.

Southwestward of Grosse isle are Reaux and Madame islands, composed of slate rock, low, wooded, and connected together by reefs of slate nearly dry at low water. All of the above-named islands and the

reefs of slate rock, thinly covered with sand and mud, which extend from almost all of them, bound South channel on its northern side for nearly 13 miles southwestward of Crane island.

Crane Island spit, with less depths than 18 feet, extends southwestward $1\frac{3}{4}$ miles from point Aux Pins; the shallowest part of the shoal, with 5 feet water over it, lies about $\frac{1}{4}$ mile from the point.

Buoy.—The southwestern end of this spit is marked by a conical red buoy, No. 78B, moored with two beacons on the southern coast of Crane island in line.

Beacons.—The eastern of these beacons, painted red, is situated 250 yards westward of Crane Island wharf; and the western, painted white, 200 yards farther westward. These beacons in line, bearing 64° . lead, in not less than 24 feet water, southward of and very close to Crane Island spit, but, with that depth, only as far westward as the red buoy.

Leading mark.—The southeastern extreme of Crow island in line with the western extreme of Middle island, bearing 19° , leads northwestward of Crane Island spit and buoy, in about 19 feet water.

Bank.—A narrow bank, having several shoals with 20 to 23 feet water on them, extends southwestward from Crane Island spit and connects it to the bank extending southwestward from Margaret tail.

Margaret tail, extending southwestward $1\frac{1}{4}$ miles from Margaret and Cliff islands, which are nearly joined at low water, is slate, some parts of it being awash at low tides.

Lightbuoy.—A red lightbuoy, No. 80B, showing an intermittent white light, is moored in $4\frac{1}{4}$ fathoms at the southwestern extreme of Margaret tail, and with St. Thomas point bearing 151° , distant nearly $1\frac{7}{8}$ miles. This buoy is also a quarantine buoy, and has "Quarantine" in yellow letters on the body of the buoy.

Leading mark.—St. Antoine church on Crane island in line with the southern end of Haystack island, bearing 51° , leads southward of Margaret tail and the buoy, but in a least depth of only 22 feet.

Grosse Isle patch is a rocky shoal, 1,200 yards long, northeast and southwest, 300 yards wide, and with 7 feet least water, lying westward of Margaret tail; and the channel between them is $\frac{1}{4}$ mile wide, with a depth of $5\frac{1}{4}$ fathoms in the fairway.

Buoy.—A black can buoy, No. 81B, is moored in 4 fathoms water at the northeastern end of the patch.

Grosse Isle rock—Buoy.—This rock, with 7 feet water over it, lies nearly 400 yards off the southern side of Grosse isle and $\frac{1}{4}$ mile from the western pier; a red conical buoy, No. 82B, is moored on the rock.

A rock with 15 feet water over it lies westward of Grosse Isle patch, and with the outer end of Grosse Isle western pier bearing 15° , distant 1,200 yards.

Grosse isle may be easily recognized from the number of buildings on it forming the quarantine establishment. There are two piers on the southern coast, one 600 yards from the western end, which has a depth of 15 feet at low water alongside it; the other, near the middle of the island, having 11 feet at its outer end. The hospital, a conspicuous brick building, is $\frac{1}{4}$ mile from the eastern end, and the superintendent's house is immediately behind the flagstaff. The churches visible from South channel are the Episcopal church, a brown building with a low tower, on an eminence immediately north-eastward of the western pier; and the Roman Catholic church, with a small spire, situated near the middle of the southern coast, and visible only from the eastward and westward, being obscured from the southward by a rocky mound in front of it.

Directions and leading marks.—Proceeding to the quarantine station, bring the northwestern end of Two Heads island in line with the western end of Cliff island, bearing 21° , and steer on the range northwestward of Margaret tail, and between it and Grosse Isle patch until Grosse Isle Patch buoy bears about 341° , when round the buoy into the anchorage; or if proceeding to Quarantine pass, steer northward after passing Grosse Isle Patch buoy until Crow island is open northward of the rocks of le rocher Rouge, and then steer on that range into Quarantine pass, northwestward of the shoal off Cliff island.

The Episcopal church at Grosse isle in line with the inner end of the western pier, bearing 359° , leads in $3\frac{3}{4}$ fathoms between the 15-foot rock, westward of Grosse Isle patch, and that patch; and the summit of Margaret island in line with the northern end of Cliff island, bearing 52° , leads northward of Grosse Isle patch to the quarantine anchorage. A good cross mark for that anchorage is the Episcopal church just open eastward of the western pier. The northern end of Race island, a little open southward of Margaret island, bearing 51° , leads in 23 feet southward of Grosse Isle patch.

Quarantine anchorages.—All merchant vessels are obliged to communicate with the quarantine authorities at Rimouski, and if not there at Grosse isle, whence they are allowed to proceed if granted pratique. These vessels, if necessary, anchor in 5 fathoms outside Grosse Isle patch and westward of Margaret tail, and this is one of the best anchorages in the river for riding out an easterly gale. Vessels in quarantine generally lie between Grosse Isle patch and Grosse isle, to be near the establishment, but the anchorage farther eastward in Quarantine pass, northward of Margaret island, is far preferable.

Anchorage.—The inner anchorage at Grosse isle is useful only as a place for vessels to ride quarantine; but the anchorage outside Grosse Isle patch is a convenient place for which sailing vessels, on the approach of a strong easterly wind, may bear up, when there is not tidal stream enough for them to reach the anchorage under Crane island, 4 miles farther eastward.

Tides and tidal streams.—It is high water, full and change, at Grosse isle at 5h. 21m.; springs rise 19 feet, neaps 13 feet. The flood stream begins at 1h. 0m. after low water on the shore, or 5h. 0m. before high water at Quebec, and it runs for 5h. 10m. The ebb stream begins at 1h. 5m. after high water on the shore, or 0h. 10m. after high water at Quebec, and it runs for 7h. 10m. The tides rise and fall nearly as at Quebec, except that the rise after low water is not quite so rapid.

Grosse Isle tail extends southwestward from Grosse isle and is joined by a bar, with 15 feet over it at low water, to the banks of Madame island. Two shoals with 11 feet water on them lie on this bar about midway between Grosse Isle tail and the banks of Madame island.

Leading mark.—The western fall of the hill over cape Tourmente in line with the small rock near the eastern end of Reaux island, bearing 333° , leads over the bar in about 15 feet water.

Banks of Madame island, in their eastern part, extend 1.7 miles southward of Reaux island, and thence southwestward to where they join Madame reef.

Leading mark.—Race island open southward of Margaret island leads southward of these banks, and also southward of Grosse Isle tail and Grosse Isle patch.

Madame reef, the southwestern end of a shoal extending southwestward $2\frac{1}{4}$ miles from the southwestern end of Madame island, and really a continuation of the banks of Madame island, is about 1,200 yards long northeast and southwest, 300 yards wide, and dries $7\frac{1}{2}$ feet at low water.

Lightbuoy.—A red lightbuoy, No. 86B, showing an intermittent white light, is moored in $4\frac{3}{4}$ fathoms at the southwestern end of Madame reef, with Bellechasse lighthouse bearing about 91° , distant 3.1 miles.

Leading marks.—Berthier church open southward of Bellechasse island, bearing 92° , leads southward, and cape Tourmente chapel in line with the eastern end of Orleans island, bearing 22° , leads northwestward of this reef.

Water.—It is said that good water can be obtained on the northern side of Madame reef, as the principal impurities of the river have subsided before the stream reaches that locality.

Orleans island, the northeastern end of which lies 4.6 miles north-westward of Grosse isle, extends about 236° , 18 miles, with an average width of $3\frac{1}{2}$ miles, and it divides the river St. Lawrence into two channels. The island is usually well cultivated on the slopes and in the valleys between the hills; the summits are generally wooded and attain a height of 550 feet at about 3 miles from its southwestern end. Near its northeastern end the island rises gradually from a hillock 210 feet high to about 500 feet in the summit over Ste. Famille, and it is wooded down to the river.

The southern coast is generally composed of a small cliff which increases in height toward the southwestern end of the island and at the mouths of the rivers. On the northern coast the cliff is at some distance back from the St. Lawrence, the intermediate space being flat and cultivated. The south coast is bordered by bare flat rock that extends generally about 200 yards from the high water mark, while the north coast is fringed by a mud flat on which a coarse grass grows, and which is indented by numerous creeks. These are impassable at about half tide, and are used by bateaux for loading and discharging cargoes.

St. François parish, at the lower (northeastern) end of the island, extends across the island and about halfway to St. Jean. The church, at 210° , $1\frac{1}{2}$ miles from point Argentenaye, the northeastern end of the island, stands on the slope of a hill, and has a spire. There is a wharf on the northern side of the parish, but it is accessible only at high tide, and no regular coasting vessel frequents the north channel. A wharf, with a depth of 12 feet at its end at low water springs, has been constructed on the southern side at about $\frac{1}{4}$ mile above the church of St. François, and a daily line of market steamers runs between this and Quebec.

Lights.—There are two lighthouses at St. François; the northeastern or front lighthouse, a square white building with a red roof, 28 feet high, situated on the shore at 75° , 525 yards from St. François church, exhibits, at 30 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 10 miles.

The southwestern or rear lighthouse, a square white building with a red roof, 30 feet high, situated in a field at 222° , 1,410 yards from the front lighthouse, exhibits, at 77 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 14 miles.

The alignment of these lighthouses leads partly through North channel Traverse.

River Bellefine flows into the St. Lawrence at 2.3 miles south-westward of St. François, through a small pool that affords good shelter to boats and small craft; boats can enter about an hour before or after low water, and small craft can enter according to their draft.

There is good anchorage off river Bellefine in $5\frac{1}{2}$ to 6 fathoms, mud bottom.

St. Jean, $3\frac{1}{2}$ miles south-southwestward of river Bellefine, is a long straggling village containing a church, with a spire, which stands close to the water's edge.

A pier, with 9 feet water at its outer end, extends from this village at 600 yards southwestward of the church.

Light.—A square white lighthouse with a red roof, 30 feet high, at the outer end of St. Jean pier, exhibits at 30 feet above high water a fixed white light that should be seen, in clear weather, a distance of 10 miles.

Rivers.—River la Fleur flows into the St. Lawrence at $1\frac{1}{2}$ miles, and river Maheux at $2\frac{3}{4}$ miles, respectively, southwestward of St. Jean pier.

These rivers run through deep ravines and generally afford shelter to small craft which lie aground at low water within their entrances.

Anchorage is good off these rivers; but parallel to the shore, and generally 600 yards distant from the low water line, is a rocky ledge with depths of $5\frac{1}{2}$ to 7 fathoms over it. Vessels should anchor between this ledge and the coast of Orleans island.

St. Laurent village is 6 miles southwestward of St. Jean, though the houses are nearly continuous from one to the other. At St. Laurent there is a church, with a spire, close to the shore, and a convent just eastward of the church.

A pier, with 13 feet water at its outer end, extends from the island near the church. The freight shed, a rectanuglar drab building with a red roof, stands over the slip in the middle of the end of the pier.

Light.—An octagonal metal lantern, painted white with a green roof, on the roof of the freight shed on St. Laurent pier, at 55 feet from its outer end and 38 feet above the deck of the pier, exhibits, at 33 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 11 miles.

Tides and tidal streams.—It is high water, full and change, at St. Laurent at 6h. 20m.; springs rise $17\frac{1}{2}$ feet, neaps $14\frac{1}{2}$ feet.

The flood stream in the offing begins at 0h. 55m. after low water on the shore, or 4h. 6m. before high water at Quebec, and it runs for 5h. 0m.

The ebb stream begins at 1h. 10m. after high water on the shore, or 0h. 54m. after high water at Quebec, and it runs for 7h. 25m.

St. Patrick hole, $1\frac{1}{2}$ miles westward of St. Laurent, is off the mouth of St. Patrick river, a small stream ending in a ravine which is faced by cliffs on both sides.

There is good anchorage here in 8 to 9 fathoms.

Marand rocks consist of several rocky patches that completely fill the western cove on the southern coast of Orleans island; this cove extends about $1\frac{1}{2}$ miles eastward of St. Petronille lighthouse.

Buoy.—A red spar buoy, No. 88B, is moored in $3\frac{1}{2}$ fathoms off the southern side of Marand rocks, with St. Petronille lighthouse bearing 279° , distant nearly $\frac{3}{4}$ mile.

Leading marks.—The chimney of the lunatic asylum at Beauport, well open southward of the pier at the southwestern point of Orleans island, bearing 274° , or St. Laurent lighthouse open southward of the southern end of Orleans island, bearing 78° , leads southward of these rocks.

Light.—A square white lighthouse having sloping sides and a square lantern with a red roof, 34 feet high, on point de l'anse du Fort, St. Petronille, at the western end of Orleans island, exhibits, at 33 feet above high water, an intermittent white light every 8 seconds, thus: Light 5 seconds, eclipsed 3 seconds, which should be seen in clear weather a distance of 3 miles.

The southwestern point (named West point) of Orleans island is marked by a large hotel, and a pier, between which and Quebec a steam ferry plies regularly.

St. Petronille church, which has a spire, dominates the point, and an Episcopal church with a small spire stands between it and the hotel.

Anchorage.—There is anchorage almost anywhere clear of the shoals between Crane island and Quebec; but the best holding ground is generally on the northern side of the channel. A good position with strong westerly winds is under point St. Jean; many vessels await a favorable wind, southward of the western point of Orleans island.

With a strong westerly wind and the ebb stream good anchors and cables are necessary.

Quebec harbor comprises the St. Lawrence river and its navigable tributaries between St. Patrick hole and Carouge point (cape Rouge), both inclusive, at about 8 miles above the city. It affords excellent anchorage over its greater part, the water between the banks off each shore being free from dangers and deep.

The management of the harbor is vested in the Harbor Commission.

Beauport, a large village about $2\frac{1}{2}$ miles northeastward of Quebec, to which it is nearly joined by houses, has a large church with two steeples. Almost midway between Beauport church and Quebec is the lunatic asylum, a large collection of buildings, with a flagstaff rising from the middle of a mansard roof, and a large black chimney. The falls of Montmorency are situated about $2\frac{3}{4}$ miles northeastward of Beauport.

Beauport bank, fronting the village of Beauport and extending to Princess Louise embankment, Quebec, is a flat of slate covered with mud that extends in some parts nearly $\frac{3}{4}$ mile from the shore, and is fringed by shoal water for a further distance of $\frac{1}{3}$ mile to the depth of 8 fathoms. St. Charles river flows by several channels over the southwestern part of this bank into the St. Lawrence.

Buoys.—A red conical buoy with a flag, No. 138B, is moored in about $4\frac{1}{2}$ fathoms water on the southeastern side of Beauport bank, with the eastern corner of Princess Louise embankment bearing 214° , distant 2.2 miles. A conical red buoy, No. 140B, is moored in 6 fathoms water off the mouth of St. Charles river, with the northeastern corner of Princess Louise embankment bearing 206° , distant 700 yards.

Clearing marks.—A marine tower, 113 feet high, covered with galvanized iron, in connection with a large elevator on the cross wall near the southern side of Princess Louise basin, in line with the lighthouse at the northeastern angle of Princess Louise embankment, or the lights exhibited from them in line, bearing 230° , leads between Beauport bank and Point Levis shoal to Commissioners' wharf. L'Ange Gardien (on the northwestern shore of the St. Lawrence) lighthouses in line, bearing 26° , lead between Beauport bank and the shoals off Orleans island; St. John Church spire in line with the northern end of the northern Immigration offices at Princess Louise basin, bearing 228° , leads southward of the bank westward to St. Charles River buoy; and the southeastern end of Parliament house at Quebec in line with the northern end of the Immigration offices on Commissioners' wharf, bearing 219° , leads southeastward of the bank when westward of the line of Beauport church bearing 220° .

Fly or La Mouche bank lies off the northwestern side of the harbor between Diamond harbor and point Pizeau; a portion of the northeastern part of the bank dries at low water, and the boulders on its southwestern part also dry.

The narrow channel westward of Diamond harbor, between the bank and the northwestern shore of Quebec harbor, is 20 to 12 feet deep, the deepest water being generally at the booms which are laid between the blocks for vessels to load.

Red spar buoys mark the northwestern side of La Mouche bank and are laid generally in a depth of 9 feet at low water.

Lightbuoy.—A red cylindrical gas buoy showing an intermittent white light is moored on the northeastern edge of La Mouche bank on the following bearings: St. Columba Sillery church 123° , Quebec jail 328° . The buoy is numbered 10 Q.

Clearing mark.—Pointe au Pavillon, Orleans island, in line with point Levis, bearing 39° , leads southeastward of La Mouche bank.

Southeastern shore—Shoal.—Southwestward of the Grand Trunk railway wharf at Levis, which is marked with the name of the company, the shore dries at low water nearly to the ends of the long piers that extend off it. The shore dries for 700 yards off Hadlow cove, and there are large boulders on its outer part.

A shoal bank extends about 600 yards off the mouth of Echemin river, opposite point Pizeau.

Clearing marks.—The statue on the hospital of St. Joseph de la Délivrance open northwestward of a large black shed on the pier next southwestward of the Grand Trunk Railway wharf, bearing 45° , leads northwestward of the shoal till northwestward of the entrance of rivière de la Scie; and thence St. Nicholas church, the first westward of St. Romuald and of New Liverpool on the southern shore, in line with the extreme of that shore, bearing 242° , leads northward of the western part of this bank.

Levis, situated on the eastern shore of the harbor above point Levis, is an important town of 7,783 inhabitants; it contains a great number of prominent buildings, the most noticeable being the college, the church of Notre Dame, and the hospital of St. Joseph de la Délivrance, which is surmounted by a statue and a spire.

The terminal stations of the Intercolonial and Grand Trunk railways are on this shore, from which there is communication by steam ferry to Quebec.

Quebec city consists of two parts, the upper town, built on the ridge which forms the northwestern side of the river, and the lower town, situated on the plateau between the base of that ridge and St. Charles river, this part embracing the parishes of St. Roch and St. Sauveur.

In the upper town are the principal residences, public buildings, churches, gardens, and retail shops; and in the lower town are the banks, warehouses, and wholesale and retail stores. The population of the whole city in 1901 was 68,840.

The highest point of the city is the citadel, which is 340 feet above high water, and the most prominent buildings seen from the eastward are Laval university, Parliament house, and St. John church. The custom-house, a stone building with a dome surmounted by a flag-staff, stands at the northeastern end of the town.

Lights.—A small square, skeleton, brown tower, 74 feet high, on the northeastern angle of Princess Louise embankment, near the Immigration offices, exhibits, at 80 feet above high water, a fixed red electric arc light, which should be seen in clear weather a distance of 4 miles over a small arc on each side of the range line.

The eastern face of the marine tower, 113 feet high, situated on the cross wall, Princess Louise basin, and 230° , 563 yards from the

preceding light, exhibits, at 103 feet above high water, a fixed red electric arc light, which should be seen in, and through a small arc on each side of, the direction of the range line in clear weather a distance of 8 miles.

These lights in line lead between Point Levis shoal and Beauport bank to Commissioners' wharf, Princess Louise basin.

Anchorage.—The water in the middle of the river, southeastward of Beauport bank, is 19 to 32 fathoms deep, and anchorage there should be avoided if possible.

There is anchorage off the city of Quebec in 12 to 15 fathoms, but the water continues about 30 fathoms deep off the town of Levis. The depth decreases southwestward until between Hadlow and Wolfe coves there is no greater depth than 15 fathoms. This is the best part of the harbor for anchorage, as a bank, with less than 10 fathoms water on it, extends midway across the river from the northwestern shore, the outer edge of the bank being 700 yards distant from la Mouche bank.

There is believed to be a patch of rock or a sunken wreck, situated with the time ball bearing 264° , distant about 575 yards, and anchorage should not be taken in this immediate vicinity.

Prohibited anchorage.—Anchorage is prohibited between lines drawn from the southeastern corner of Crawford's wharf to the southeastern corner of Barras wharf, on the northeast, and from the middle of Champlain Market hall to the northwestern corner of Simpson's wharf, on the southwest. The first of these lines runs in a direction of 105° , and the second in the same direction.

This space is indicated in daytime by sign boards and at night by red lights on both sides of the river.

The ferry, and the telegraph, telephone, and electric light cables cross the harbor from Quebec to Levis in this area.

Directions—Crane island to Quebec.—From $\frac{1}{4}$ mile south-southeastward of Crane Island lighthouse, steer to pass about 200 yards north-northwestward of St. Thomas Bank lightbuoy, and then bring the apparent northern extreme of the hills on the southern shore of the river just open southward of Crane Island lighthouse, 51° , and keep this range on astern, passing about 400 yards north-northwestward of Wye Rock buoy. Keep the same range on until about 2 miles southwestward of Wye Rock buoy. Then steer to pass $\frac{1}{2}$ mile southward of St. Jean lighthouse; this course passes $\frac{3}{4}$ mile northward of Bellechasse Island lighthouse, and $\frac{1}{2}$ mile southward of Madame Reef lightbuoy. From southward of St. Jean lighthouse steer for a position midway between St. Laurent lighthouse and Beaumont reefs lightbuoy. Thence continue westward with the coast of Orleans island aboard, but keep St. Laurent lighthouse open southward of

the southern end of Orleans island in order to clear Marand rocks, which are marked by a red spar buoy. When St. Petronille light-house bears 290°, steer 275° until the marine tower and the light-house at the Princess Louise basin are in line, bearing 230°; then keep this range on, steering between Point Levis shoal and Beauport bank to Commissioners' wharf, or to about ½ mile above Point Levis light-buoy, when haul southwestward and proceed to the desired wharf or anchor at discretion as recommended.

If approaching the harbor at night, it may be advisable to anchor off St. Patrick hole, or under the western end of Orleans island, to avoid the risk of running among the shipping in the dark.

Tides.—It is high water, full and change, at Quebec at 6h. 35m.; springs rise 18 feet, neaps 12½ feet; neaps range 10 feet.

The a. m. tides are the highest from the spring equinox to the autumnal equinox, and the p. m. tides during the remainder of the year.

The greatest semidiurnal inequality yet observed is 4 feet (in September, 1888), but the average difference between the a. m. and p. m. heights of high water is about 2½ feet. The inequality in the time of high water is not so marked; the most regular was observed in June, 1888, when the p. m. tides were 24 minutes earlier than the a. m. tides. There is very little inequality in the height of low water, but that in the time is most marked, a difference of 1 hour having been observed in June, 1888. The average difference was ½ hour. The highest tides observed were during the freshets at the end of May or early in June, and at the autumnal equinoctial tides (October 8, 1887). The former rose 2½ feet, and the latter 2 feet above ordinary spring tide level.

The highest of the spring tides generally occurs on the second or third morning after the change of moon, and the lowest tide at one tide either before or after the highest. These remarks apply generally to St. Lawrence river.

As a rule the water rises higher with strong northeasterly winds, and falls lower with southwesterly winds.

The height of the tide at Quebec at every hour after low and high water at ordinary springs is:

Place.	After low water.		Flood tide.	After high water.		Ebb tide.
	<i>h.</i>	<i>m.</i>	<i>Ft. in.</i>	<i>h.</i>	<i>m.</i>	<i>Ft. in.</i>
Quebec	0	0	0 0	0	0	17 6
	1	0	5 6	1	0	15 0
	2	0	10 6	2	0	11 4
	3	0	14 9	3	0	8 0
	4	0	16 3	4	0	5 10
	4	50	17 6	5	0	3 4
				6	0	1 6
				7	0	0 2
				7	30	0 0

At neaps the whole tidal rise is not as great as at ordinary springs, and in using the above table an allowance must be made accordingly.

Tide tables for Quebec are published by the United States Coast and Geodetic Survey and by the marine and fisheries department of Canada.

Mean tide level.—A register, kept at Levis dry dock for the year 1897, shows that the mean tide level is 17.56 feet above the sill of that dock, and that this mean tide level is subject to fluctuation, being in February, 1897, nearly a foot below, and in May a foot above the mean annual tide level of that year. The extreme range of the tide occurred in March, and amounted to 24.4 feet, but the mean extreme range was 20 feet—that is, 10 feet above and below the mean level.

Tidal streams.—The flood stream begins at 3h. 55m. before high water on the shore, and runs 5h. 0m.; the ebb stream begins at 1h. 5m. after high water on the shore, and runs 7h. 30m. Close to the shore the stream turns about 20 minutes after high and low water, the flood making first on the north shore and the ebb on the south shore.

The tidal streams run generally in the direction of the river, the ebb stream being strongest on the southern shore, and the flood on the northern shore. The flood stream sets rather toward Beauport bank, and should be guarded against. The ebb attains a rate of $4\frac{1}{2}$ knots off point Levis, and the flood of $3\frac{1}{2}$ knots off the Citadel.

Table showing tidal data.

Place.	High water, full and change.		Springs rise.	Neaps.		Semidiurnal inequality.				Flood stream af- ter low water.		Ebb stream after high water.		Duration of—			
				Rise.	Range.	Greatest in height of high water.	Average.	Greatest in time of low water.	Average.					Flood.	Ebb.		
	<i>h.</i>	<i>m.</i>	<i>Ft.</i>	<i>Ft.</i>	<i>Ft.</i>	<i>Ft.</i>	<i>Ft.</i>	<i>h.</i>	<i>m.</i>	<i>h.</i>	<i>m.</i>	<i>h.</i>	<i>m.</i>	<i>h.</i>	<i>m.</i>	<i>h.</i>	<i>m.</i>
Rivière du Loup.....	3	10	16 $\frac{1}{4}$	10 $\frac{1}{2}$	7	3 $\frac{3}{4}$	2 $\frac{1}{4}$	0	32	0	15	0	46	0	29	6	20
Off Orignaux point ...	3	47	17 $\frac{1}{2}$	13	9 $\frac{3}{4}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	.....	.....	0	30	1	10	5	55	6	30
Bay St. Paul.....	4	23	18 $\frac{1}{2}$	13	10	4	2 $\frac{1}{4}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Jean Port Joli.....	4	58	17 $\frac{1}{2}$	12	9 $\frac{1}{4}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	0	52	0	27	.....	.....	5	53	6	30
L'Islet.....	5	11	18	13	10 $\frac{1}{4}$	.....	.....	.....	.....	.....	.....	0	30	0	30	5	50
Grosse isle.....	5	21	19	13	11	.....	.....	.....	.....	.....	.....	1	0	1	5	7	10
Berthier.....	5	40	17 $\frac{1}{2}$	14	11	3 $\frac{3}{4}$	2 $\frac{1}{2}$	0	52	0	32	1	10	1	5	7	20
St. Laurent.....	6	20	17 $\frac{1}{2}$	14 $\frac{1}{2}$	11	5 $\frac{1}{2}$	2 $\frac{1}{2}$	0	46	0	30	0	55	1	10	7	25
Quebec.....	6	35	18	12 $\frac{1}{2}$	10	4	2 $\frac{1}{2}$	1	0	0	30	1	10	1	5	7	30
Ste. Anne de Beaupré.	6	2	17 $\frac{1}{2}$	12 $\frac{1}{4}$	9 $\frac{1}{2}$	3	1 $\frac{3}{4}$	0	55	0	30	0	45	1	0	5	15

Princess Louise tidal basin, at the northeastern side of Quebec, has an area of 21 acres, with a quay frontage of 1,100 yards, and a depth of 25 feet at low water. Immediately along the face of the quay wall the depth is 24 feet, but at 10 feet distant therefrom there is a depth of 25 $\frac{1}{2}$ feet at low water spring tides. The entrance to the tidal basin is 200 feet wide.

Princess Louise wet dock, opening from the tidal basin, is about 800 yards long, 200 yards in average breadth, with an area of 40 acres, and a quay frontage of about 1,130 yards. The depth of water in the dock is 22 to 30 feet, and the depth on the sill of the gates 35 feet, at high water springs. The width of the entrance from the tidal basin is 66 feet.

Vessels can enter the wet dock at each time of high water.

Lines of railway for the shipment of freight to and from all parts of Canada extend to this dock and basin.

Wharves.—There are numerous wharves at Quebec and at Levis, the depths alongside which range from 19 to 40 feet, but any vessel can lie close to them by regulating the distance off according to draft. Large vessels can moor alongside Commissioners' wharf. Point à Carcy wharf is 350 feet long, and has a depth of 40 feet at low water ordinary springs alongside it; large vessels are recommended to go alongside this wharf with head downstream, and with the starboard anchor down to haul off by. To afford more accommodation for sea-going steamers the breakwater has been extended 962 feet northward, the total length being 2,260 feet, giving 4 berths for largest steamers, and the new work has a depth of 42 feet at low water along its outer face.

Docks—Levis or Harbor Commissioners' dry dock is situated on the Levis side of the river at about 1 mile eastward of Levis point. Its length on blocks is 600 feet, breadth of entrance, $61\frac{1}{2}$ feet, and depth of water on blocks $23\frac{1}{4}$ feet at high water springs.

There are two warping buoys off the entrance of this dock.

Davie's floating docks No. 1 and No. 2 are situated at Levis, close northeastward of the ferry. The length of No. 1 is 236 feet, breadth of entrance 41 feet, and it will take a vessel drawing 13 feet water. Vessels longer than this dock have been accommodated by building a water-tight compartment at the end. The lifting power of this dock is 2,175 tons.

The length of No. 2 is 180 feet, breadth of entrance 39 feet, and it can take a vessel drawing 13 feet. Its lifting power is 1,605 tons.

Russell's floating dock is situated at Levis, and $\frac{1}{2}$ mile southward of the ferry wharf. It is 225 feet long over all, $41\frac{1}{2}$ feet broad at entrance, and takes a vessel drawing $15\frac{1}{2}$ feet; it has a lifting power of 2,500 tons.

Davie's marine railway is situated close to the two floating docks bearing that name; the length of cradle is 150 feet, and can take on a vessel drawing 10 feet.

Russell's gridiron, 200 feet in length, is close to Russell's floating dock.

Roche stone graving dock, with a length of 375 feet, a breadth of 51 feet, and a depth over the sill of 16 feet at high water is situated in Wolfe's cove.

Repairs.—Large repairs to hull, machinery, and boilers can be executed at Quebec. There is a 25-ton crane and a 9-ton steam hammer. Forgings too large to be made at Quebec are executed at New Glasgow and forwarded by rail. Steel castings are made in Montreal by the Montreal Steel company.

Pilotage rates.—The rates from Bic island, or any place below the anchorage of Brandy Pots, off Hare island, to Quebec, between May 1 and November 10, are \$3.87; between November 10 and November 19, \$4.95; after November 19 and earlier than March 1, \$6.02; and from March 1 to May 1, \$4.41 for each foot draft of water.

From the anchorage off Brandy Pots, or any place between it and St. Roch point, to Quebec, the rates are $\frac{2}{3}$ of the above.

From St. Roch point, or any place between it and point aux Pins, Crane island, to Quebec, the rates are $\frac{1}{3}$ of those from Bic to Quebec. From point aux Pins, or any place between that and St. Patrick hole to Quebec, the rates are $\frac{1}{4}$ of those from Bic to Quebec.

From Quebec to Bic or the place where the pilot may be landed in the river below Quebec, the rates are, from May 1 to November 10, \$3.40; from November 10 to November 19, \$4.46; after November 19 and earlier than March 1, \$5.54; and from March 1 to May 1, \$3.93 for each foot of draft.

The pilotage charge for moving a vessel from any wharf in the harbor of Quebec between point à Carcy, below, and the western end of Allan's wharf above, to any other wharf within the same limits is \$2.50; and the charge for moving a vessel from any place, not being a wharf, within the above limits to any other place, not being a wharf, within the same limits, is \$5.

In 1902, 105 pilots of the Quebec pilot commissioners effected pilotages.

The Canadian Marine and Fisheries department controls the pilotage between Quebec and Montreal.

Tugs may be obtained by telegram from any of the telegraph and signal stations. There are 5 first class and 10 smaller tugs at Quebec, 3 tugs at Batiscau, 3 at Sorel, and one at Three Rivers. The charges are fixed by agreement, although a nominal tariff is in existence.

The wrecking steamer Lord Strathcona is stationed at Quebec under contract with the Canadian government, and is available at any time, four hours' notice being sufficient.

Ice.—The river seldom, if ever, freezes across below Quebec, but it is almost filled with ice that fluctuates with wind and tidal stream from

shore to shore; the ebb stream and westerly winds carrying it to the southward, and the flood stream with easterly winds to the northward.

As an average the first arrival of steam vessels at Quebec from Montreal occurs on April 27, the first arrival from sea on April 28, and the last departure for sea on November 27. The ferry steamers cross from Quebec to Levis till near the end of January, and would occasionally run all the winter, but are compelled to lay up so that the ice may consolidate across the river. The bridge thus formed breaks up usually late in March or early in April, though it has remained till April 24.

Supplies.—Provisions of all kinds can be obtained at Quebec. Water may be obtained by boat from the hydrants in the city, or from the river. Vessels in Princess Louise docks are supplied with water free of cost.

Coal.—Vessels can coal either from lighters or at the wharves. The greatest quantity of coal is brought from Nova Scotia, but there are occasional cargoes of English, Welsh, and Scotch coal.

About 25,000 tons are generally stored at the various coal depots.

Wood can be bought without difficulty; it is generally stored in large quantities near the Canadian Pacific Railway station in the lower town. Bateaux are continuously employed in carrying wood from the numerous localities on the north shore of the river, where it is cut.

Trade.—The total value of the exports from Quebec in 1902 was \$4,438,492, and of the imports \$6,941,665.

Customs.—There are no special customs regulations.

Sailors' home, hospitals, etc.—There is no sailors' home at Quebec. Seamen are shipped under the direction of the Marine department. Sick seamen are cared for at the Jeffrey Hale hospitals and the hotel Dieu.

The United States is represented by a consul, a vice-consul, and a consular agent.

Communication.—Quebec is in communication with European ports as follows: Liverpool, Glasgow, and London, weekly, by the Allan line; Liverpool and Glasgow, weekly, by the Dominion line; Antwerp, London, Hull, Leith, and Newcastle, fortnightly, by the Leyland line; Manchester, about every 10 days, by Manchester liners; Hamburg, irregularly by Hamburg-American line; Cape-town and ports in South Africa, monthly, by the Canada-South Africa line; Rotterdam, Canadian, Ocean and Ireland line, fortnightly; Antwerp, by the Canadian Pacific Atlantic lines, weekly; Glasgow, by the Donaldson line, weekly; Belfast and Dublin, by

the Head line, weekly; Cardiff, by the Lord line, monthly; Thompson line, weekly to London, fortnightly to Leith, monthly to Aberdeen.

A steamer of the Quebec Steamship company runs fortnightly from Quebec to Summerside, Charlottetown, and Pictou, calling at the principal ports in the gulf on the way; and a steamer of the Gaspé Steamship line runs fortnightly to Douglastown and Gaspé basin, calling at all ports on the southern side of the lower St. Lawrence.

A steamer of the North Shore Steamship line carries the mails to the settlements on the northern shore of the estuary and gulf as far as Eskimo point, calling also at English point, Anticosti, and sailing from Quebec every 10 days. The steam vessel King Edward sails from Quebec every 10 days for north shore ports as far as Natashkwan, and makes one trip every season to Blanc Sablon. Steamers of the Richelieu and Ontario Steam Navigation company run from Montreal to Quebec, Murray bay, Tadoussac, and Saguenay river, three times a week from June 1 to 15, and thence daily (except Sundays) till September 17. Local steamers run to the near villages twice a week; to Ste. Anne de Beaupré daily; and ferries run to Orleans island and to New Liverpool several times in the day.

There is communication by rail with all parts of Canada and the United States.

The telegraph office at Quebec belongs to the Great North Western Telegraph company of Canada, and there is communication with the telegraph systems of the world.

Time signal.—A time signal is made at the citadel daily, except on Sundays, and is a ball which is hoisted halfway up its mast at $\frac{1}{4}$ hour before, and to the masthead at 5 minutes before, the signal. This ball is dropped at 1h. 0m. 0sec. mean time of the meridian of 75° W. longitude, which is equivalent to 6h. 0m. 0sec. Greenwich mean time.

If the signal fails in accuracy the ball is hoisted halfway up its mast and kept there for $\frac{1}{2}$ hour.

The time signal mast is in latitude $46^{\circ} 48' 23''$ N., longitude $71^{\circ} 12' 35''$ W.

Weather.—Snow generally begins to fall early in October; the hills become white in November and continue so till May. The snowfall between December and March is heavy. Patches of snow remain in the valleys till June.

The wind blows generally up or down the river, the proportion of southwesterly winds being about 5 to 4 of northeasterly winds. Fog

prevails principally in July and August, and smoke is very common in August and September, but no time of the year is free from fog.

The average height of the barometer for the year is 29.96 in.; for January, 30.00 in., and for June, 29.89 in. The mean temperature is 39°; it is highest at 96° in August, and lowest at —34°.3 in January.

Storm signals are shown from the citadel at Quebec.

NORTH CHANNEL, NORTH TRAVERSE, AND ORLEANS CHANNEL (continued from p. 463).

North channel above Goose cape is not generally used for navigation, yet cases may occur, as, for instance, when South channel is obstructed by ice, in which it may be necessary to use it.

The entrance to North channel, between the reef which extends northeastward about one mile from Baleine point, the northeastern end of Coudres island, and the shoals which stretch across Éboulements bay, is $1\frac{1}{2}$ miles wide, and the depth in it reaches 30 fathoms. The narrowest part of the channel northwestward of Coudres island is 1 mile wide, and lies between Prairie shoal, off Prairie point, and the mainland near cape Corbeau.

St. Paul bay, between cape Corbeau and cape de la Baie (or cap d'Arrêt), dries nearly to the line of these points, and there is no passage into either of the rivers at the head of the bay at low water. The point in the middle of the bay, separating the mouths of the rivers, is wooded and has on it a conspicuous sand hill, 30 feet high. The village of St. Pierre et St. Paul is situated near the bridge which crosses rivière du Gouffre, the eastern stream, at about 1 mile from the entrance, and contains a church with two spires which is visible from some parts of the channel. The population of the village is about 1,400.

Tidal stream.—The ebb stream sweeps round this bay at a rate of $7\frac{1}{2}$ knots at springs, and makes a ripple which is dangerous for boats.

Anchorage.—There is a limited space between the northwestern edge of the tidal stream and the shoal water of the bay, where small vessels anchor securely in 5 fathoms water; it is situated at about $\frac{1}{4}$ mile eastward of the middle of the bay, and about 200 yards distant from the depth of 18 feet at low water.

The northern shore of the river, westward of St. Paul bay, trends south-southwestward and rises steeply to the summits of high wooded hills, that attain a height of 2,650 feet northwestward, nearly 2 miles from cape Maillard. At $1\frac{1}{2}$ miles south-southwestward from cape de la Baie, a small strip of low flat land, lying between the foot of the hills and high-water mark, commences, and extends south-southwest-

ward to Grande point, a distance of 5 miles. Numerous houses, forming the parish of Petite rivière, are built on this flat; and among them is St. François Xavier church, with a single spire. Several valleys indent the hills, the most marked being about 2 miles north-eastward of St. François Xavier church.

La Baie bank.—A plateau of rock covered with mud and boulders, and which dries at low water, extends 1,200 yards off cape de la Baie, and thence fringes the shore generally for the distance of about $\frac{3}{4}$ mile as far southwestward as Petite rivière, a distance of $3\frac{3}{4}$ miles. Southwestward of this the plateau continues at from 1,000 to 600 yards off the land to Sault au Cochon, a farther distance of 8 miles, where the water is deep to within about 300 yards of the shore. From cape de la Baie south-southwestward to Sault au Cochon the water deepens to 5 fathoms about 400 yards off the flat, which dries at low water.

Buoy.—A conical red buoy, No. 104 B, is moored in 4 fathoms water, close southward of Claude shoal, the highest accumulation of boulders off cape de la Baie, and with that cape bearing 324° , distant nearly $\frac{3}{4}$ mile.

Lightbuoy.—A red spar buoy, No. 106 B, showing an intermittent white light, automatically eclipsed at short intervals, is moored in 5 fathoms, off Grande point on the following bearings: Wharf at Sault au Cochon, 216° ; sawmill at Grande point, 300° .

Clearing marks.—Cape Gribanne open southeastward of cape Maillard, bearing 212° , leads eastward of this shoal when northeastward of Petite rivière; and the first notch in the hills northwestward of mount Éboulements in line with cape Branche, the western end of Coudres island, bearing 34° , leads eastward of the shoal when southwestward of St. François Xavier church.

Cape Maillard, about $3\frac{1}{2}$ miles south-southwestward of Petite rivière, rises to la petite butte Ronde, a conical wooded hill 774 feet high, at about 600 yards inland, and is conspicuous from the northeastward and southwestward. There are two small shingle beaches, named Petit Abattis and l'Abattis, situated south-southwestward of cape Maillard; and on l'Abattis, which is $1\frac{1}{2}$ miles distant from that cape, there are several conspicuous houses.

Sault au Cochon village contains a group of houses, a small church, a disused mill, and a wharf which marks the limit of the low-water line. Southwestward of Sault au Cochon the low-water line extends only a short distance from high-water mark.

Cape Gribanne lies $4\frac{1}{2}$ miles southwestward of Sault au Cochon.

Longue pointe, a rocky ledge, extends southeastward from the land at 800 yards northeastward of cape Gribanne, with depths of 8,

12, and 21 feet over it, at distances of 600, 800, and 1,000 yards, respectively, from the shore.

Buoy.—A conical red buoy, No. 108 B, is moored in 5 fathoms water close eastward of this ledge.

Clearing mark.—The houses at l'Abattis well open southeastward of the wharf at Sault au Cochon, bearing 24° , leads close southeastward of this ledge, in about 7 fathoms.

Landing may be effected in boats after half flood at l'Abattis, Petit Abattis, and Grande point, and generally along the coast of the parish of Petite Rivière; but care must be taken to avoid the bowlders that stand above the general level of the flat ground between high and low water marks. The best landing place is Petit Débarquement, on either side of a small mound joined to the main by a sandy beach at 1 mile northeastward of cape Gribanne.

Cape Brûlé lies 2.1 miles southwestward of cape Gribanne.

Light.—A square white lighthouse, 34 feet high, on the edge of the cliff at cape Brûlé, exhibits at 148 feet above high water a fixed white light, which should be seen in clear weather a distance of 15 miles.

There is a dwelling near this lighthouse.

Range lights.—An open framed tower, 24 feet high, situated 324° 60 feet from the main lighthouse, exhibits at 128 feet above high water a fixed white light, which should be seen in clear weather a distance of 15 miles.

An open-framed tower, 34 feet high, situated 14° , 330 feet from the preceding lighthouse, exhibits at 158 feet above high water a fixed white light, which should be seen in clear weather a distance of 15 miles.

These lights in line 14° lead between Traverse spit and Brûlé bank, and with the preceding light are known locally as those of montée du Lac.

Coudres island.—Baleine point, the eastern end of Coudres island, lies southwestward 5 miles from Goose cape, and the island extends southwestward 5.9 miles from the point, with an average width of 2 miles. Baleine point, the northeastern point of the island, slopes from a wooded mound 63 feet high and appears as an island from a short distance. The northwestern coast of the island rises steeply to wooded hills 390 feet high, southeastward of which is a cultivated valley separating the hills from a ridge 62 feet high and faced by a cliff that extends generally along the southeastern coast. Numerous houses are built on this ridge, and a round stone mill stands near its middle.

The southern points of the island are at the base of bold bluffs, and a mound 90 feet high known as la butte à Gaillard rises north-

ward of le Havre, the western of the two coves at the southern end of the island. The point extending southward from la butte à Gail-lard is a wooded hillock 40 feet high, and appears as an island from a short distance. Cape Branche, the western point of the island, rises to a steep, wooded bluff 180 feet high.

St. Louis church, with two spires, is situated on the northern shore of l'Anse, the eastern cove at the southern end of the island.

Coudres island is surrounded by reefs, on several of which are large rows of stakes with nets affixed to catch the marsouin, or white fish, that frequent this part of river St. Lawrence in the early part of the summer.

The population of the island is 1,500.

Prairie bay lies on the northwestern side of Coudres island between cap à l'Aigle and Prairie point, and is one of the most sheltered anchorages in the river. The shore dries at low water 300 yards from the high water mark, and depths less than 5 fathoms extend 600 yards farther.

Goose cape shelters Prairie bay from easterly gales, and prevents any sea of consequence from rolling in, so that this anchorage is quite safe in all winds; the clay bottom being good holding ground, and the tidal stream easy if the vessel be not anchored too far out. The anchorage space is nearly 1 mile long, and about 600 yards wide, in depths of 3 fathoms to 10 fathoms, which latter depth is about $\frac{3}{4}$ mile from the shore, and beyond which the water deepens suddenly, and the streams are rapid. The best berth is in 6 fathoms, near the middle of the bay, where an easterly gale has been ridden out with ease and safety. This is a good anchorage for vessels to run for when meeting an easterly wind below South Traverse.

Pier.—A pier extends from cap à l'Aigle, and it has a depth of 17 feet at its outer end at low water.

Light.—A lantern on a mast 20 feet high, at the outer end of the pier at cap à l'Aigle, the eastern entrance point of Prairie bay, exhibits, at 25 feet above high water, a fixed white light, that should be seen, in clear weather, a distance of 5 miles.

Prairie shoal extends $\frac{3}{4}$ mile offshore between Prairie point and cape Branche; numerous bowlders of the shoal, dry at low water, about 1,200 yards offshore.

Buoy.—A black can buoy, No. 103 B, is moored in 13 feet water off this shoal.

Clearing marks.—The church of Notre Dame des Éboulements open northward of the inner end of the pier at cape St. Joseph, bearing 50° , leads close northward, and l'Islet d'en haut, at the southwestern end of Coudres island, open westward of cape Branche, bearing 166° , leads westward of this shoal.

The two points on the northeastern side of St. Paul bay in line, bearing 293° , lead northeastward of the shoal.

Directions.—From below Middle ground stand over toward les Éboulements, going no nearer to the reef off the northeastern end of Coudres island than the depth of 10 fathoms. When cap à l'Aigle bears 256° steer along the coast of Coudres island, passing close to cap à l'Aigle into the anchorage. From the southwestward, approach with the church of Notre Dame des Éboulements open northward of the inner end of the pier at cape St. Joseph, bearing 50° , until St. Pierre church is shut in behind the northeastern side of St. Paul bay, or the points on the northeastern side of that bay are in line, when haul into the anchorage. Vessels should moor at Prairie bay, or at least have a kedge out to insure keeping a clear anchor.

Tides and tidal streams.—It is high water, full and change, at Prairie bay at 4h. 25m.; springs rise 17 feet, neaps $10\frac{1}{2}$ feet. In the bay the flood stream is longer than the ebb, the water flowing for 6h. 20m., and ebbing for 6h. 0m., and this differs from the streams in every other part of the river. The flood stream, at the anchorage in 6 fathoms, is stronger than the ebb, its rate being about 4 knots at springs. The ebb stream is turned off to a great extent by Prairie shoal; its rate for the first 2 hours is about 2 knots; it then slacks for about 5 minutes so completely, that a vessel will swing to the wind; the stream then becomes stronger and regular during the remainder of the tide, its rate being about $3\frac{1}{2}$ knots at springs.

Anchorage under Coudres island in easterly winds is very good, the best position being in 7 fathoms, with the southern point of Coudres island bearing about 65° .

Coudres bank extends southwestward from Coudres island and shoals rapidly within the depth of 5 fathoms. There is good anchorage on its western side in 7 to 8 fathoms.

Clearing mark.—The landslip near cape St. Joseph, open northwestward of cape Branche, bearing 26° , leads northwestward of this bank till abreast cape Maillard. Vessels anchoring may swing into this line, but not farther northward than the southwestern point of Coudres island bearing 84° .

Neptune rock (rocher de Sault au Cochon) lies nearly 15 miles southwestward of Coudres island, and nearly $\frac{3}{4}$ mile southeastward of the edge of the shoals. It is about 200 yards in length, northeast and southwest, and has two heads, both of which are 1 foot above high water spring tides. There are shoals and many rocks that dry between Neptune rock and Burnt Cape ledges to the southwestward and some between Neptune rock and Coudres island to the northeastward.

Burnt Cape ledges are an extensive chain of graywacke and slate rocks. The southwestern end is an islet 12 feet high, which bears 98° , $1\frac{3}{4}$ miles from cape Brûlé; and on the reef southeastward of this islet there is a hut with a roof 8 feet above high water.

Brûlé bank.—The northeastern end of Brûlé bank in 3 fathoms bears 67° , 1.4 miles from cape Brûlé, and the bank, a sand flat which partly dries 5 feet at low water, extends thence southwestward 3.8 miles. The southwestern part of the bank is joined by shoal water to the shoals extending southwestward from Burnt Cape ledges. The channel between Brûlé bank and the northwestern shore is 1,200 yards wide, and has depths of $5\frac{1}{2}$ to 13 fathoms water in it. This is the only channel, but Brûlé cul de sac, an inlet in the banks, lies between the northeastern part of Brûlé bank and Burnt Cape ledges, and must be avoided by keeping the north shore aboard after arriving off the eastern part of the ledge.

Buoy.—A black can buoy, No. 109 B, is moored in 4 fathoms off the northeastern end of Brûlé bank, with cape Brûlé principal lighthouse bearing 238° , distant 1.8 miles.

Leading mark.—The western end of Two Heads island in line with the southwestern end of Burnt Cape ledges, bearing 151° , leads over the northeastern end of Brûlé bank in a depth of 18 feet.

Eastern narrows of North Traverse, between the southwestern end of Brûlé bank and the northeastern point of Traverse spit, lies southward 2.6 miles from cape Brûlé, and has a least depth of 4 fathoms in its fairway. Traverse spit is an extensive reef of slate extending northeastward 3.6 miles from the northeastern end of Orleans island. The narrows is only 300 yards wide, with depths greater than 3 fathoms; but a large part of the spit, as well as of Brûlé bank, dries soon after half ebb, and thereby greatly lessens the difficulty of the passage.

Buoys.—A black can buoy, No. 111 B, is moored in 3 fathoms on the eastern side of Eastern narrows and at the southwestern extreme of Brûlé bank; and a red cylindrical gas buoy, No. 110 B, exhibiting an intermittent white light, is moored at the northeastern end of Traverse spit and on the western side of Eastern narrows.

Western narrows, between Traverse spit and West sand, is 300 yards wide, with depths over 18 feet, but has a depth of $4\frac{1}{4}$ fathoms in its fairway. Between Eastern and Western narrows there is a least depth of 4 fathoms in the fairway. West sand lies southward of Traverse spit and extends southward 1.1 miles with a greatest width of nearly 600 yards. The depths over it are generally 10 to 12 feet, but over its shoalest part the depth is only 5 feet.

Buoy.—A black can buoy, No. 113 B, is moored in 28 feet water close northeastward of this shoal.

Clearing marks.—The southern extremes of Orleans island just open of each other, bearing 214° , leads northwestward; and the southwestern end of the islet at the southwestern end of Grosse isle in line with the northeastern side of the islet eastward of Reaux island, bearing 109° , leads close northeastward of West sand.

Tides.—It is high water, full and change, at North Traverse, Orleans island, at 5h. 40m.; springs rise 17 feet, neaps 13 feet.

Cape Tourmente, southwestward 1.9 miles from cape Brûlé, marks the southwestern end of the land rising steeply from the river. Its summit is a densely wooded hill, 1,874 feet high, nearly $\frac{3}{4}$ mile northward of the cape, on the slope of which, and at 1,692 feet above high water, is a small chapel, the spire of which is visible from many parts of the river.

North channel—Directions.—From southward of cape St. Joseph keep cape Martin and Goose cape in line astern, bearing 64° , until l'Islet d'en haut opens westward of cape Branche, when steer southwestward up the channel.

In passing do not close cape Branche to less than $\frac{1}{2}$ mile nor to less than 10 fathoms water, and even that with due caution, for the bank off Coudres island is steep to southward of the cape. After passing Coudres island the edge of the bank may be approached to 7 fathoms until abreast Neptune rock.

If on the northwestern side of the channel, keep cape Gribanne open southeastward of cape Maillard, bearing 212° , in order to clear the shoal off cape de la Baie, until as far southwestward as Petite Rivière. Farther southwestward, where the shoal extends nearly $\frac{3}{4}$ mile offshore, keep the first notch in the hills northwestward of mount Éboulements in line with cape Branche, bearing 34° , till off Sault au Cochon, after which the shore becomes bold.

After passing Sault au Cochon the houses at l'Abattis well open of the wharf at Sault au Cochon, bearing 24° , just clears Longue pointe, after which keep the northern shore well on board until abreast cape Brûlé. Then bring and keep the leading lighthouses (open framed towers), on that cape in line, bearing 14° , through Eastern narrows, between the buoys there, until the upper St. François lighthouse is slightly open southeastward of the lower one, bearing 222° . Steer with these lighthouses so open, but before the islet at the southwestern end of Grosse isle is in line with the islet eastward of Reaux island, bearing 109° , bring the southern extremes of Orleans island just open of each other, bearing 214° , to pass close northward of West Sand buoy and between West sand and Traverse spit. When St. Vallier church opens westward of Madame island, or St. Joachim church is shut in with Orleans island, steer to pass $\frac{1}{2}$ mile eastward of St. François front lighthouse, whence gradually close the coast of

Orleans island to the distance of $\frac{1}{4}$ mile, and steer into South channel, thence proceeding to Quebec as directed on page 491.

Tidal streams.—The streams in North channel attain their greatest rate between Coudres island and St. Paul bay, where the rate of the ebb is $7\frac{1}{2}$ knots, and of the flood about 6 knots, at springs. The streams set fairly through North Traverse, and attain a rate of $3\frac{1}{2}$ to 4 knots at springs. In strong breezes opposed to these streams there is a high breaking sea that is very dangerous for boats. In North channel the streams turn at about the same times as those in the opposite part of South channel.

Channels.—Besides Western narrows there is an inferior channel, named West Sand passage, between West and Center sands, as wide as Western narrows, but with only $3\frac{1}{4}$ fathoms water in it. For this, and another channel southward of Center sands, the chart must be the guide.

Orleans channel is not suitable for vessels drawing over 15 feet water, as there are several shoals nearly in mid-channel with that depth, and it should not be attempted without a pilot or some local knowledge.

Lights.—The following leading lights facilitate the navigation of this channel:

Ste. Famille.—A mast, 50 feet high, with a white shed at its base, on the beach near a stone mill, at Ste. Famille, exhibits, at 50 feet above high water, a fixed white light that should be seen in clear weather a distance of 12 miles.

A square white lighthouse with a red roof, 21 feet high, at about $\frac{1}{4}$ mile southwestward of the church at Ste. Famille, and 800 yards 52° from the preceding light, exhibits, at 245 feet above high water, a fixed white light that should be seen in clear weather a distance of 16 miles.

These lights in line 52° lead through best water clear of all obstructions from intersection with St. Pierre range off Batture des Islets to intersection with L'Ange Gardien range off pointe au Pavillon black buoy No. 135 B.

Point St. Pierre.—A square white lighthouse, with a red roof, 23 feet high, on point St. Pierre, and close to the high-water mark, exhibits, at 20 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 9 miles.

A mast 50 feet high, with a white shed having a red roof, at its base, and situated 218° , 180 yards from the preceding lighthouse, exhibits, at 50 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 12 miles.

These lights in line 218° lead clear of all obstructions from mid-channel opposite Ste. Famille wharf to intersection with Ste. Famille range.

L'Ange Gardien.—A square white lighthouse, with a red roof, 23 feet high, on the beach between l'Ange Gardien village and Montmorency falls, on the mainland, northwestern shore, exhibits, at 20 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 9 miles.

A square white lighthouse, with a red roof, 21 feet high, situated 26°, 473 yards from the preceding lighthouse, exhibits, at 33 feet above high water, a fixed white light that should be seen, in clear weather, a distance of 11 miles.

These lights in line 26° lead clear of all obstructions from intersection with Ste. Famille range to junction of Orleans channel with South channel opposite west point of Orleans island.

Buoys.—A red conical buoy, No. 120 B, is moored on the southeastern edge of Seminaire spit, with cape Brûlé bearing 32°, 2.9 miles.

A black can buoy, No. 121 B, is moored on the northwestern edge of Traverse spit.

A black can buoy, No. 123 B, is moored on the northern edge of the shoal which lies in mid-channel southward of Ste. Anne river.

A black can buoy, No. 125 B, is moored on the northwestern edge of the shoal in mid-channel southward of Ste. Anne river.

A red conical buoy, No. 126 B, is moored at the eastern end of the spit extending from the batture des Islets, a bank of bowlders that dries at low water situated nearly in mid-channel northeastward of point St. Pierre.

A black can buoy, No. 127 B, is moored on the northwestern edge of the shoal extending off Orleans island between Ste. Famille and point St. Pierre.

Red conical buoys, Nos. 128 B, 130 B, 132 B, 134 B, are moored on the southeastern edge, the southern edge, the southwestern edge, and the western edge, respectively, of the batture des Islets.

A black can buoy, No. 135 B, is moored on the northwestern edge of the bowlders off pointe au Pavillon, but not of the shoal lying eastward of it.

A red conical buoy, No. 136 B, is moored on the southeastern corner of the sand bank that extends from the north shore off Beauport.

Directions for Orleans channel.—From about $\frac{1}{4}$ mile off cape Brûlé steer to pass a similar distance southeastward of the red buoy on Seminaire spit; then steer southwestward and bring the apparent northwestern extreme of Orleans island, westward of the pier at St. François, in line with the northern end of that pier, bearing 243°. Keep this range on passing 200 yards northward of Traverse Spit buoy, and keep the range until the church of Ste. Anne de Beaupré is in line with the sharp peak on the western summit of the ridge northward of Chateau Richer, bearing 257°; when steer on that range, passing between the banks.

When Chateau Richer church is in line with the northern fall of the hills over l'Ange Gardien, bearing 235°, steer on that range until Parliament house, at Quebec, is in line with the apparent northwestern extreme of Orleans island, bearing 224°. This range leads in mid-channel between the shoals until St. Pierre lighthouses are in line, bearing 218°, when steer with them in line until Ste. Famille lighthouses are in line, bearing 52°. Keep these lighthouses in line astern until Beauport church south spire is midway between the extremes of the two western of Hall's wharves at Montmorency falls, bearing 236°. This range leads northward of the shoal extending northward of pointe au Pavillon, and when l'Ange Gardien lights are in line, bearing 26°, keep them so astern until Quebec range lights are in line, when steer for them and proceed as before directed.

Tides and tidal streams.—It is high water, full and change, at Ste. Anne de Beaupré at 6h. 2m.; springs rise 17½ feet, neaps 12¾ feet; neaps range 9½ feet; the flood stream begins 4h. 10m. before high water on the shore, and it runs 5h. 10m.; the ebb stream begins 1h. 0m. after high water on the shore, and it runs 7h. 15m. The tidal streams run generally in the line of the channel, and attain a rate of 3 to 4 knots at springs.

The following table has been placed in its component parts under the places to which it refers. It is inserted here in full for convenience.

Table showing approximately the height of the tide at every hour after low and high water in ordinary spring tides.

Place.	Hours after low water.		Flood tide.	Hours after high water.	Ebb tide.	
			Height.		Height.	
	<i>h.</i>	<i>m.</i>	<i>Fl. in.</i>	<i>h.</i>	<i>m.</i>	<i>Fl. in.</i>
Tadoussac, entrance to Saguenay river.....	0	0	0 0 l. w.	0	0	17 0 h. w.
	1	0	1 3	1	0	15 0
	2	0	4 6	2	0	12 0
	3	0	8 0	3	0	8 0
	4	0	12 0	4	0	4 0
	5	0	15 6	5	0	1 0
Brandy Pots.....	6	8	17 0 h. w.	6	16	0 0 l. w.
	0	0	0 0 l. w.	0	0	17 0 h. w.
	1	0	1 3	1	0	15 0
	2	0	4 7	2	0	12 0
	3	0	9 5	3	0	8 6
	4	0	13 8	4	0	5 6
St. Roch des Aulnaies.....	5	0	16 0	5	0	3 0
	5	50	17 0 h. w.	6	0	1 0
				6	34	0 0 l. w.
	0	0	0 0 l. w.	0	0	17 0 h. w.
	1	0	2 6	1	0	14 9
	2	0	5 3	2	0	11 9
Quebec.....	3	0	9 6	3	0	8 6
	4	0	13 6	4	0	5 6
	5	0	16 3	5	0	3 0
	5	35	17 0 h. w.	6	0	1 6
				6	50	0 0 l. w.
	0	0	0 0 l. w.	0	0	17 6 h. w.
	1	0	5 6	1	0	15 0
	2	0	10 6	2	0	11 4
	3	0	14 9	3	0	8 0
	4	0	16 3	4	0	5 10
	4	50	17 6 h. w.	5	0	3 4
				6	0	1 6
				7	0	0 2
				7	30	0 0 l. w.

CHAPTER XIII.

PROVINCE OF QUEBEC—ST. LAWRENCE RIVER, QUEBEC TO MONTREAL.

VARIATION IN 1908.

Quebec-----	17° 05' W.	|	Three Rivers -----	16° 14' W.
Sorel-----	15° 02' W.	|	Montreal-----	14° 42' W.

NOTE.—The distance between Quebec and Montreal by the river St. Lawrence is 139 miles; of this distance about 88 miles is naturally deep water, and through the remaining parts, which are obstructed by banks and flats, a ship channel has been dredged to the depth of 30 feet at low water.

The present navigable channel between Quebec and Sorel has a least depth of 30 feet at ordinary low water, and a minimum width of 300 feet, while between Sorel and Montreal the channel has a minimum width of 450 feet, with widths of 500 to 750 feet at all curves, and a least depth of 30 feet at the lowest water of 1897, or about $31\frac{1}{2}$ feet at ordinary low water.

Dredging in progress.—Dredging is in progress in the river to give a clear navigable channel between Quebec and Sorel, having a least width of 450 feet, with widths of 500 to 750 feet in the bends, and a clear depth of 30 feet at the extreme low water of 1897. The length remaining to be dredged at the end of the navigable season of 1904 was $17\frac{3}{4}$ miles.

The new channel will give nearly 4 feet greater draft for navigation than the old channel.

Fluctuation in depth.—The river has a very great annual fluctuation. Its average height above ordinary low water is, in May, $6\frac{1}{2}$ feet; June, $4\frac{1}{2}$ feet; July, $3\frac{3}{4}$ feet; August, $1\frac{3}{4}$ feet; September, 1 foot; October, 4 inches; November, 9 inches.

The total rise in water level in the river at ordinary low water from Quebec to Montreal is about 29 feet, thus: From Quebec to Portneuf, 4 feet; Portneuf to Batiscan, $10\frac{1}{2}$ feet; Batiscan to Three Rivers, $3\frac{1}{2}$ feet; Three Rivers to Montreal, 11 feet.

The low water of 1897, the lowest on record, except the short period of extraordinary low water in 1895, has been adopted as the river level, at which the channel would be made 30 feet in depth.

The navigable depth in the channel dredged to the depth of 30 feet at lowest water of 1897 was in 1904: In May, 39 feet 11 inches; in June, 38 feet 1 inch; in July, 34 feet 5 inches; in August, 33 feet 1 inch; in September, 33 feet 1 inch; in October, 34 feet 0 inch; in November, 32 feet 11 inches. The greatest depth from May to November was 41 feet 0 inch, and the least, at the end of November, 31 feet 9 inches.

Weather.—The weather on the St. Lawrence, between Quebec and Montreal, is remarkably favorable for navigation. Fogs are most infrequent and of short duration. Smoke rarely affects day navigation. Snowstorms do not last over 24 hours; and in these a ship should anchor and await fine weather.

Navigability.—Vessels drawing 30 feet can now navigate the St. Lawrence up to Montreal. The completed sections of the ship channel between Quebec and Sorel are being marked with leading lights and lightbuoys to facilitate navigation both by day and night for all vessels inward bound, as well as light colliers outward. The part between Sorel and Montreal has been completed throughout, and the largest vessels that can reach Sorel may proceed with safety to Montreal at night.

The best time to leave Quebec, when ascending the river in a steamer with a speed of 15 knots, is at the top of high water, as the flood stream is then carried as far as it goes.

Ice. (See pp. 495 and 544.)

Pilots are indispensable in the St. Lawrence above Quebec, and they are obtainable at the pilotage offices at Quebec and Montreal. The pilotage system between Quebec and Montreal is under the control of the department of marine and fisheries, and every pilot when engaged to pilot any vessel must, as late as possible before his departure, obtain information as to the state of the buoys, beacons, and channel.

Pilot charges.—The pilotage dues for any seagoing steam vessel between Quebec harbor and Three Rivers, or any place above Portneuf and below Three Rivers, is \$1.75 for each foot draft of water; between Quebec and Sorel, or any place above Three Rivers and below Sorel, \$1.87½ for each foot of draft; between Quebec and Montreal, or any place above Sorel and below Montreal, \$2.50 for each foot of draft, both upward and downward.

From Montreal to Sorel, or any place above Sorel and below Hochelaga, and from Sorel or any place above Sorel and below Hochelaga, to Montreal, the rate is \$1 for each foot of draft.

Buoyage.—The river channel is marked by numerous buoys and lightbuoys, which, in accordance with the Canadian system, are

black, with odd numbers, on the port hand, and red, with even numbers, on the starboard hand, ascending the river. The numbers increase ascending the river. The buoys are also marked with letters, thus: Q in Quebec district, C in Champlain district, L in Lake St. Peter district, and M in Montreal district.

Their positions are shown on the charts.

All the port hand spar buoys and a few isolated starboard hand spar buoys have tops of fir trees lashed to them, which make them very conspicuous. (1904.)

In the dredged channels the buoys are moored to the edges of the cut, and, owing to the rapidity of the current, it is necessary to allow considerable slack in their moorings, as if tautly moored the current would either drag the anchors or drag the buoys under water. Therefore, allowance should be made for the swing of the buoys in passing them.

Only the lightbuoys are described herein.

Passing vessels.—No vessel between Quebec and Montreal may pass another vessel proceeding in the same direction in any dredged channel (excepting the straight reaches in lake St. Peter), nor in the undredged channels, unless there is a distance of 350 feet between the vessels as they pass. In every case a vessel overtaking another and intending to pass shall signal the other when at a distance of $\frac{1}{2}$ mile, by giving one prolonged blast of the steam whistle, and the other shall answer by a similar signal. Then, while the one vessel is overtaking and passing the other, if there be not more than 350 feet between them, the latter shall slacken her speed to dead slow, and the former shall also slacken her speed to a rate merely sufficient to allow her to pass the other.

All up-going vessels, on each occasion, before meeting down-going vessels at sharp turns, narrow passages, or where navigation is intricate, shall stop and, if necessary, come to a position of safety below the point of danger and remain there until the channel is clear.

Tides.—It is high water, full and change, at—

Quebec at 6h. 35m.; springs rise 18 feet, neaps rise $12\frac{1}{2}$ feet.

St. Nicholas at 7h. 10m.; springs rise 17 feet, neaps rise $11\frac{1}{2}$ feet.

Platon point at 8h. 16m.; springs rise $14\frac{1}{2}$ feet, neaps rise $9\frac{1}{2}$ feet.

Cape à la Roche at 9h. 30m.; springs rise 6 feet, neaps rise 4 feet.

Champlain at 11h. 1m.; springs rise 3 feet, neaps rise 2 feet.

Three Rivers at 11h. 30m.; springs rise 1 foot.

Point du Lac, tide ends.

From Quebec to Batiscan, a distance of 51 miles, the tidal rise may be taken advantage of, but from Batiscan to Three Rivers, 17 miles farther up, owing to uncertainty of time and height, it can not be depended on for navigation.

At spring tides above Three Rivers the water is banked up, and remains higher than during neaps; with this exception the tide is not felt above Three Rivers.

Easterly gales are said to cause spring tides to rise 1 to 2 feet higher at Three Rivers, and a rise of 3 to 4 inches at springs at point du Lac.

Tide tables are published by the Canadian department of marine and fisheries for St. Croix bar, together with tide tables for Quebec.

Tidal streams.—Between Quebec and cape à la Roche both flood and ebb streams are felt. In the vicinity of point aux Trembles (17 miles above Quebec), the flood stream begins at 50 minutes after low water, and runs $4\frac{1}{2}$ hours; the ebb begins 10 minutes after high water and runs $7\frac{1}{2}$ hours. Near Portneuf the ebb stream begins at high water and runs 9 hours; the flood runs for about 2 hours. but it is scarcely perceptible at neaps.

Current.—Above cape à la Roche the current is always down, and between that cape and lake St. Peter the effect of the tide is an increase or decrease in the rate of the downward current.

Rate.—The rate of the current varies throughout; its general average is $2\frac{1}{2}$ miles an hour. It is greatest at Richelieu rapids; at cape à la Roche; and at St. Marys rapid, in Montreal harbor. No reliable rates have been obtained, but in some parts of the river it is about 1 mile an hour; in lake St. Peter about $\frac{3}{4}$ mile an hour; and in St. Marys rapid about 6 to 7 miles an hour. It is usually greater in spring than at other times of the year.

The river St. Lawrence, at just above the entrance of Chaudière river (which is on the southern shore 5 miles above Quebec), is rather less than 800 yards wide, between steep, high, and partly wooded banks, composed of graywacke and slate rocks, and of great beauty. The channel of the river is farther reduced at low water by rocky shoals, which dry out from the shore on either side. The breadth of the stream is then only 575 yards, but the depth is nearly 30 fathoms, and the rate of the ebb stream about 6 knots, and that of the flood 5 knots.

Sault pass.—This narrow pass is called the Sault; and it is here that the drift ice packs and forms an ice bridge, over which a sleigh road is made almost every winter. In this chapter no effort is made to describe the banks of the river, the numerous islands, villages, and settlements. There are so many that their description would be

impracticable and it is entirely unnecessary, as the seaman visiting the St. Lawrence river will be concerned only with the principal ports. Therefore the aids to navigation and channels are the only things described.

Railway bridge.—A railway bridge is built across the river at the Sault pass and about 670 yards westward of Chaudière river mouth. There is a clear headway under the bridge of 150 feet at ordinary high water for a width of 1,200 feet. The cantilever piers stand on the edge of the deep water channel on both sides of the river, and are 1,800 feet apart. Vessels should keep in mid-channel under the bridge.

Lights.—A fixed white light is exhibited at 35 feet above high water from each of the cantilever piers of the bridge, and they should be seen, in clear weather, a distance of about 2 miles.

Anchorage.—There is excellent anchorage off Carouge (cap Rouge), on the northern shore, about 2 miles above Sault pass.

The river from abreast Carouge expands into a reach from 2 to $2\frac{1}{2}$ miles wide, which extends westward for some 20 miles. The high and steep banks on either side form occasionally precipitous headlands, while the fields and houses of the peasantry, and the villages, 6 to 7 miles apart, with their stone churches and tinned steeples, often situated on the projecting points and headlands, afford altogether scenery of considerable beauty.

There are no difficulties in the navigation, even for large ships, as high up as Portneuf, which is on the northern shore, 32 miles above Quebec.

Point à Basile range lights.—A square white lighthouse with a red lantern, 49 feet high, on point à Basile, on the southern shore of the river opposite Carouge, exhibits, at 93 feet above high water, a fixed white light, which should be seen, in clear weather, a distance of 15 miles.

A square open framework lighthouse with sloping sides, and wooden slats toward the front lighthouse, painted white, with a red lantern, and 32 feet high, at 79° , 1,367 yards from the preceding light, exhibits, at 200 feet above high water, a fixed white light, which should be seen on the range line from a distance of 14 miles.

These two lights in line form a range for descending the river, and in descending vessels should bring them in line, 79° , when abreast of Frechettes islands and keep the range on until Confederation point is abeam.

In ascending, vessels should pick up the back range when Confederation point is abeam and carry it to Frechettes islands.

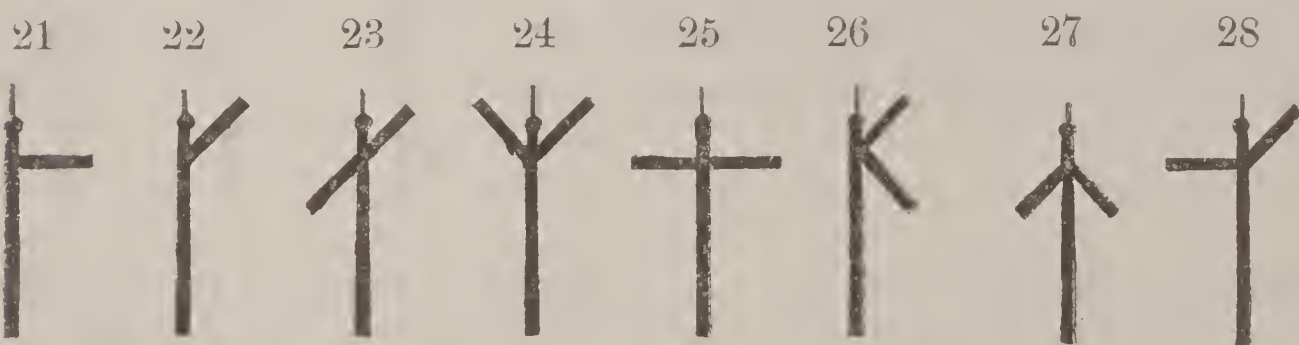
St. Augustin shoal extends off the northern shore of the river at 5 to 6 miles above point à Basile. The navigable channel over its southern part or bar has been dredged to a depth of 27 feet at extreme low water, and Point à Basile lighthouses in line astern, 79° , lead through the fairway. This is the shallowest part of the river between Quebec and Montreal, and vessels of heavy draft should not pass it at extreme low water.

St. Augustine Shoal lightbuoy.—A black cylindrical gas buoy, No. 15 Q, with a domed top, carrying a lantern on a framework, $9\frac{1}{2}$ feet above the water, is moored off point Nicholas at the lower end of St. Augustin shoal. The buoy shows an intermittent white light every 6 seconds, thus: Light 4 seconds, eclipsed 2 seconds, visible 8 miles.

Semaphore.—A semaphore is placed on point Nicholas to indicate the depth of water in the channel over St. Augustin bar.

Semaphore signals, showing depth of water in feet.

Looking up stream.

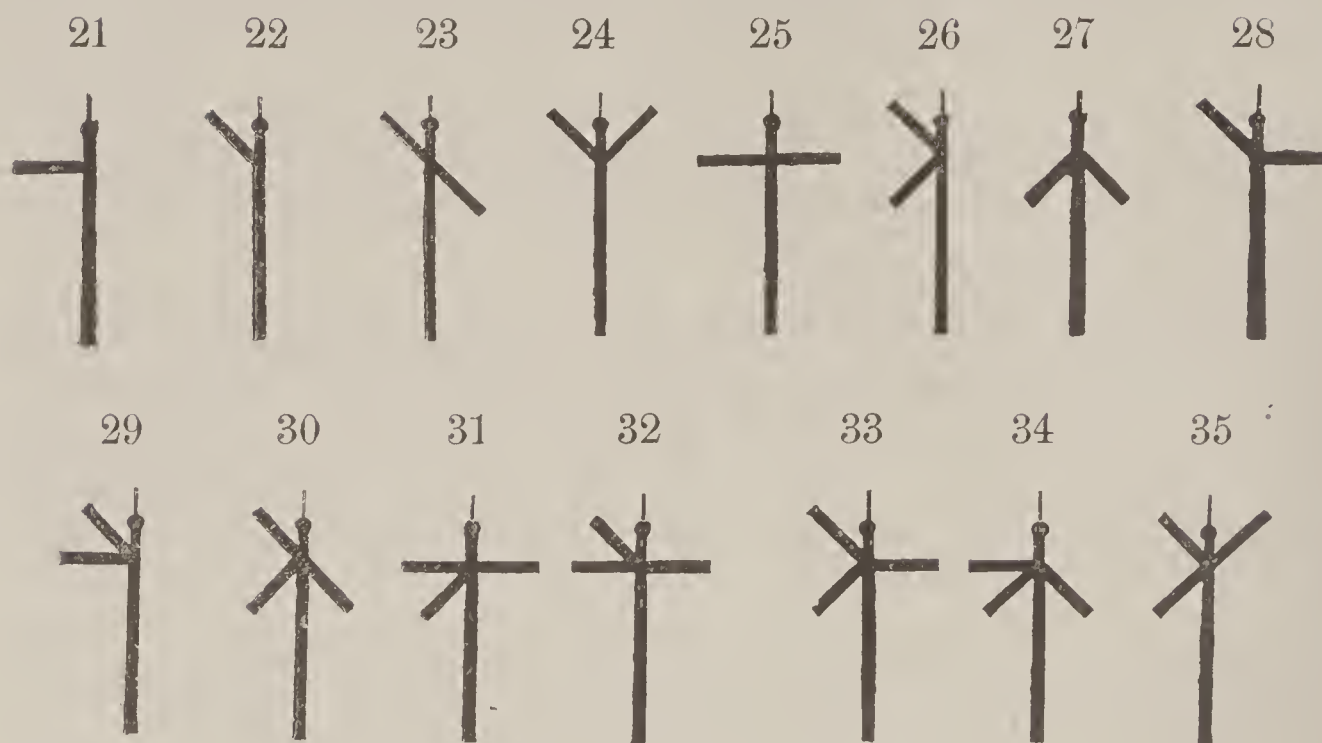


23' 3" 23' 6" 23' 9"

The lower arm indicates inches to be added to the feet shown by the upper arm.

Ball at head of flagpole indicates rising tide.



Looking downstream.

23' 3'' 23' 6'' 23' 9''

The lower arm indicates inches to be added to the feet shown by the upper arm.

Ball at head of flagpole indicates rising tide.



Tides.—It is high water at St. Augustin shoal at 45 minutes before high water at St. Croix, and low water at the shoal at 65 minutes before low water at St. Croix.

Trembles shoals, together with les Ecureuils (Paget) bank, commence at about 16 miles above Quebec and extend westward along the northern shore of the river for about 8 miles up the river, leaving a channel between the shoals and bank and the southern shore, in some places only 800 yards wide.

Trembles Shoal lightbuoy, situated in 7 fathoms water on the southeastern side of the shoal and about $1\frac{1}{2}$ miles southeastward from Point aux Trembles church, is a red cylindrical buoy, No. 24 Q, with a domed top carrying a lantern on an open-work frame $9\frac{1}{2}$ feet above the water, and exhibits an intermittent white light every 12 seconds, thus: Light, 7 seconds; eclipse, 5 seconds; visible 8 miles.

St. Antoine range lights.—The front lighthouse of the downstream range and the rear lighthouse of the upstream range is a brown, square, skeleton tower, with an inclosed white upper part and a red lantern roof, 65 feet high, on a black cribwork pier situated on the eastern side of St. Antoine point on the southern side of the river;

and it exhibits, at 68 feet above high water, a fixed white light, visible 9 miles.

The back lighthouse of the downstream range is a similar tower, situated 228° , 275 yards from the front lighthouse of the downstream range, and it exhibits, at 203 feet above high water, a fixed white light, visible 16 miles.

The front lighthouse of the upstream range is white, square, with a red roof, and 30 feet high; it is situated on the western side of St. Antoine point, and it exhibits, at 36 feet above high water, a fixed white light, visible 6 miles on the range line.

Directions.—Vessels leaving Quebec should steer in mid-channel about 195° until abreast Princes pier on the eastern shore of the river; then 226° to within about $\frac{7}{8}$ mile of the railway bridge. At this point change course to 247° and steer that course through Sault pass and until Point à Basile range comes nearly on astern. Get that range and keep it to Frechettes islands near the northern bank of the river, steering 259° . When leaving the alignment of Point à Basile lighthouses, take that of St. Antoine downstream lighthouses, 228° ; after passing Trembles Shoal lightbuoy steer to pass about 200 yards southward of lightbuoy No. 28 Q, and about the same distance northward of black can buoy No. 27 Q moored near the edge of the shoal to the westward of point St. Antoine, and then steer about 238° until St. Antoine upstream lighthouses are in line astern, 71° , when steer on that range until past red buoy No. 32 Q.

Point St. Antoine lightbuoy.—A red cylindrical lightbuoy, No. 28 Q, showing an intermittent white light, is moored on the northern side of the channel off point St. Antoine.

St. Croix bar is about $\frac{3}{4}$ mile westward of the western part of les Ecureuils bank; a channel 500 feet wide has been dredged over the bar to the depth of 29 feet.

St. Croix lightbuoy.—A red cylindrical gas buoy, No. 34 Q, showing an intermittent white light, is moored at the southeastern end of the cutting over St. Croix bar.

St. Croix Bar range lights.—Two square white lighthouses with red lantern roofs are situated upon the high south bank of the river, the front one, 23 feet high, at about 100 yards from the shore, and 1.7 miles eastward from St. Croix village, and the rear lighthouse, 54 feet high, at 115° , 470 yards from the front lighthouse. Each exhibits a fixed white light, visible 8 miles, the front light being 186 feet and the rear light 238 feet above high water. The lights in line, 115° , lead through St. Croix Bar dredged channel. The front light is visible over a small arc on the line of the dredged channel, and also downstream from the northeastward. The rear light is visible in the direction of the range line.

The distance from the alignment of the leading lights to the edge of the middle ground on the southwestern side of the channel is only 250 feet. Great caution is therefore necessary in navigating this channel.

St. Croix light.—A square white lighthouse, 41 feet high, on the shore, near high water mark, at about $\frac{1}{4}$ mile northward of St. Croix church, exhibits, at 41 feet above high water, a fixed white light, visible 6 miles.

The river from St. Croix bar continues northwestward for about $4\frac{1}{4}$ miles to Platon point; then turns sharply southwestward around a shoal extending $1\frac{1}{4}$ miles westward from the point. This shoal is composed of shale covered with mud and strewn with bowlders and rocky patches that cover at high water. The turn of the river around Platon point forms a large peninsula of which the point is the northern extremity.

Two obstructing shoals off cape Santé have been deepened, for a width of 500 feet, to 29 feet at extreme low water.

Platon Point lightbuoy.—A black cylindrical gas buoy, No. 49 Q, is moored in 5 fathoms, on the edge of the shoal water at about 800 yards northwestward of the outer end of Platon wharf, and it exhibits an intermittent white light, visible 4 miles.

This buoy marks the turn of the channel off Platon point, but the light must not be depended on.

Portneuf village is situated on the northern shore of the river northwestward from Platon point. It has paper, saw, flour, and carding mills, and a nail factory.

Directions.—As soon as buoy No. 32 Q is passed, steer about 266° in order to run onto the range line of St. Croix Bar lights, 200 yards southward of lightbuoy No. 34 Q. Get the back range as accurately and as quickly as possible, and keep on it across the bar. The range may also be kept up to the turn around Platon point. Keep it on until Platon Point lightbuoy No. 49 Q bears 243° , when steer about 264° for the range line of the Portneuf lights, being very careful not to cross the range line. Get on this range accurately as soon as possible and hold it to its intersection with the Lôtbinrière range.

Richelieu rapid, the first great difficulty in the navigation, commences just above Portneuf and extends nearly to Grondine, a distance of about 7 miles southwestward. In the narrowest part of the rapid the channel runs between extensive shoals formed of bowlders, and is only 460 yards wide at low water. The water is 7 to 10 fathoms in depth, except on Boulard bar, situated about $1\frac{1}{4}$ miles above Richelieu island, where a channel has been dredged to the depth of 29 feet for a width of 500 feet. The flood stream has a rate of $\frac{1}{2}$ knot and it lasts for only about 1 hour, while the ebb runs at the rate of

7 knots at springs. The pass is therefore difficult and dangerous, and steamers depart from Quebec at such times as to arrive at the foot of Richelieu rapid with the flood stream.

Portneuf range lights.—On the northern shore of the river, on the rising ground at about $\frac{3}{4}$ mile eastward of Portneuf, is a white light-house consisting of a dwelling with a lantern on its roof, 30 feet high; and at 28° , 180 yards from it, is a white lighthouse, 26 feet high; each exhibits a fixed white light, the front light being 120 feet, and the rear light 200 feet above high water, both visible 5 miles.

These lights in line astern 28° lead through the northeastern portion of Richelieu channel to the alignment of Lôtbinière lights.

Richelieu Island light.—A white octagonal lighthouse, 35 feet high, on the middle of the island, exhibits, at 27 feet above high water, a fixed white light, visible 6 miles.

Lôtbinière range lights.—On the southern shore, about $2\frac{1}{2}$ miles above Richelieu island, is a square white lighthouse with a red roof, 17 feet high, and there is a similar lighthouse, bearing 222° , 950 yards from it. Each exhibits a fixed white light, the front at 23 feet and the rear at 85 feet above high water, and they are visible 8 and 10 miles, respectively.

These lights in line 222° lead through Richelieu rapid from the alignment of Portneuf lights to that of Boulard Bar lights.

Boulard Bar range lights.—On Richelieu Island reef, about 400 yards, 6° from the island, is a white octagonal lighthouse, 42 feet high, on a red-brown circular pier and with a red lantern, which exhibits, at 40 feet above high water, a fixed white light, visible 9 miles.

On the edge of the cliff, at about 1.4 miles above Platon point, is a red square skeleton tower, with a white slat work on the upper portion of its side facing the channel, and an inclosed white upper part, 61 feet high, which exhibits, at 160 feet above high water, a fixed white light, visible over a small arc in the direction of the range line a distance of 11 miles.

These lights in line astern 53° lead from the alignment of Lôtbinière lights through the middle of the dredged channel across Boulard bar nearly up to Batture Simon lightbuoy No. 68 Q.

Platon range lights.—Two white lighthouses, in line bearing 55° and 169 yards apart, each with a black vertical stripe on the side facing the channel, on the southern shore, about $1\frac{1}{2}$ miles below Richelieu island, exhibit, at 130 and 152 feet above high water, fixed white lights, visible 12 miles, but they do not lead through the dredged channel, and mariners must not be guided by them.

Batture Simon lightbuoy.—A red spar gas-buoy, with an open conical topmark, No. 68 Q, is moored at the southern end of batture Simon, and exhibits an intermittent white light, visible 4 miles.

Light.—A square white lighthouse, 8 feet high, on Langlais point, on the southern shore, $\frac{3}{4}$ mile below Great Chêne river, exhibits, at 35 feet above high water, a fixed white light, visible 5 miles.

Leading mark.—From southeastward of Batture Simon light-buoy, Lôtbinière church and an elm tree in line astern 61° leads to the alignment of Cape Charles lighthouses.

Horseback bar is southeastward of Grondine, and a channel has been dredged through it to the depth of $27\frac{1}{2}$ feet for a width of 300 feet.

Horseback Bar lightbuoys, Nos. 73 Q and 77 Q, moored at each end of Horseback Bar dredged channel, are black spar gas buoys, and each exhibits an intermittent white light.

Grondine point is a low forked point extending southward from the northern shore of the river. From the point shoals extend southward and westward, those extending southward nearly meeting the shoals on the southern shore. A channel has been dredged through the shoals. Southward of the point the river turns west.

Cape Charles range lights.—A white polygonal lighthouse, 12 feet high, on cape Charles, southern shore of the river, exhibits, at 92 feet above high water, a fixed white light, which should be seen 6 miles. This is the front lighthouse.

A red square skeleton lighthouse, with an inclosed white upper part, 61 feet high, at 232° , 417 yards from the preceding lighthouse, exhibits, at 145 feet above high water, a fixed white light, which should be seen 12 miles. This is the back lighthouse.

These lights form St. Charles lower range and in line lead through the middle of the dredged channel over Horseback bar from below black buoy No. 73 Q, to the alignment of Ste. Emilie range lights.

An additional fixed white light is exhibited from a mast at 96° 80 yards from the front lighthouse, in line with which light it leads between cape à la Roche and cape Charles. This forms St. Charles upper range.

The channel from about 1 mile above Horseback bar, runs through cuttings with a minimum width of 300 feet and a depth of $27\frac{1}{2}$ feet for about 7 miles.

Lightbuoy No. 80 Q, moored at the lower end of cape Charles dredged channel, is a red spar gas buoy, which exhibits an intermittent white light.

Directions.—After getting on Lôtbinière range, keep on it until Boulard Bar range is coming on astern. Bring that range on and steer on it across the bar and in the channel until Deschambault point bears about 40° , when steer so as to bring that point and the slope of the mountain northeastward of it in line, bearing 42° .

Keep this range on until nearly abreast lightbuoy No. 68 Q, when Lôtbinière church and an elm tree southwestward of it will be nearly in range astern. Bring this back range on and keep it until Cape Charles lower range is nearly on; bring this range on and steer on it through the dredged channel over Horseback bar nearly to Ste. Emilie range line.

Ste. Emilie—Range lights.—A square white lighthouse with a red vertical stripe facing the range line on its western side, 30 feet high, on top of a bank on the southern shore to the southward of Grondine, 1 mile above the village of Ste. Emilie, exhibits, at 114 feet above high water, a fixed white light, visible 16 miles on the range line.

A similar lighthouse, at 93° , 1,140 yards from the preceding lighthouse, exhibits, at 131 feet above high water, a fixed white light, visible 16 miles in all directions of approach.

These lights in line astern 93° , lead midway between buoys Nos. 79 and 80 Q, off cape Charles to the curve of cape à la Roche.

Lightbuoy No. 90 Q, moored in the middle of cape à la Roche curve, is a red spar gas buoy, which exhibits an intermittent white light.

Semaphore.—A semaphore stands at about $\frac{1}{4}$ mile westward of Cape à la Roche church to indicate the depth of water in Cape à la Roche dredged channel. (For signals, see p. 513.)

Grondine Point range lights.—The front lighthouse, a square red skeleton tower, 29 feet high, on Grondine point, exhibits, at 33 feet above high water, a fixed white light, visible 7 miles on the range line.

The rear lighthouse, a square white building, 61 feet high, situated 67° , nearly 1.4 miles from the front lighthouse, exhibits, at 66 feet above high water, a fixed white light, visible 8 miles on the range line.

Lightbuoy No. 97 Q, moored at the upper end of Cape à la Roche dredged channel, is a black steel spar buoy, exhibiting an intermittent white light.

Grondine upper range lights.—The front lighthouse, a square white building, 18 feet high, situated on the northern shore of the river at 1.4 miles northwestward of Grondine point, exhibits, at 28 feet above high water, a fixed white light, visible 8 miles on the range line.

The rear lighthouse, a square white building, 40 feet high, situated 45° , 1.1 miles nearly from the front lighthouse, exhibits, at 68 feet above high water, a fixed white light, visible 9 miles on the range line.

The river at cape à la Roche, 2 miles below Grondine point, turns southwestward for 6 miles to Batiscan river on the northern shore. For most of this distance the channel is toward the southern shore,

but just below Batiscan river it shifts to the northern shore. Much of the distance runs through dredged channels.

Ste. Anne shoals extend southward and southeastward from Ste. Anne river on the northern shore toward cape Levrard on the southern shore. Between the 18-foot lines on each side the channel is 400 yards wide, but in its narrowest part the water is deep.

Lightbuoys.—No. 107 Q gas buoy, moored off cape Levrard, is a black spar buoy, surmounted by a lantern exhibiting an intermittent white light.

No. 110 Q gas buoy, moored at the turn above cape Levrard, is a similar red buoy, showing an intermittent white light.

No. 117 Q gas buoy, moored at the upper end of Batiscan dredged channel, is a similar black buoy, exhibiting an intermittent white light.

St. Pierre des Becquets light.—A white octagonal lighthouse, 30 feet high, on the summit of St. Pierre point, on the southern shore, at about $5\frac{1}{4}$ miles above cape à la Roche, exhibits, at 85 feet above high water, a fixed white light, which should be seen 5 miles.

Batiscan range lights.—The front lighthouse, white, octagonal, and 18 feet high, on the northern shore of the river, westward of St. Pierre point, exhibits, at 20 feet above high water, a fixed white light, visible 4 miles.

The rear lighthouse, white, octagonal, and 36 feet high, at 240° , 683 yards from the front lighthouse, exhibits, at 42 feet above high water, a fixed white light, visible 4 miles.

Anchorage.—There is good anchorage off the village of Batiscan, about $\frac{1}{4}$ mile westward of lightbuoy No. 123 Q.

Directions.—Proceeding upward, with Ste. Emilie range lights in line astern 93° , leave that line and take that of Grondine point range lights astern 67° at cape à la Roche bend, making the turn after passing buoys Nos. 87 Q and 88 Q, and completing it before reaching buoys Nos. 91 Q and 92 Q. Keep the alignment of Grondine Point lights until past buoy No. 97 Q, when gradually turn into the alignment of Grondine upper range lights astern 45° (the channel is wide at this bend), and keep this alignment until opposite lightbuoy No. 110 Q, when turn and bring Batiscan range lights into line 240° , taking care not to run past their alignment. Keep Batiscan lights in line until past buoys Nos. 117 Q and 118 Q, then turn southwestward with Batiscan church and the pine trees to the southwestward in line, and pass through the cutting marked by buoy No. 119 Q.

The river above buoy No. 119 Q turns southward for about 4 miles to abreast Citrouille point, and there is one cutting off Batiscan. The

channel continues on the northern and western sides; on the southern side shoals fringe the bank for $\frac{1}{2}$ to $1\frac{1}{4}$ miles.

Lightbuoys.—No. 123 Q gas buoy, moored at the lower end of Batiscan anchorage, is a black spar, and it exhibits an intermittent white light.

No. 129 Q gas buoy, moored at the lower end of Batture Perron cutting, off Batiscan, is a black spar, and it exhibits an intermittent white light.

Citrouille Point light.—A square white lighthouse, with a red lantern on the middle of its roof, 41 feet high, on a pier on the beach at Citrouille or Champlain point, exhibits, at 40 feet above high water, a fixed white light, visible 11 miles.

Gentilly range lights.—The front lighthouse is a square white building, surmounted by a square white lantern with a red roof, the whole being 23 feet high, situated on a concrete pier 29 feet high, on the flats a little more than $1\frac{1}{2}$ miles, 18° from Gentilly church. It exhibits at 45 feet above high water, a fixed white light, visible in the line of range 7 miles.

The rear lighthouse is an open framework square tower painted brown, but with an inclosed watch room painted white, and surmounted by a white lantern having a red roof, and with the upper part of the framework, facing the channel, covered with white slat work. The whole building is 81 feet high, situated $1\frac{1}{3}$ miles 198° from the preceding light, and exhibits at 101 feet above high water, a fixed white light, visible in the line of range 8 miles.

These two lights in line 198° lead through the dredged 30-foot channel from the bend just above buoy No. 119 Q to the bend at Batture Perron southeastward of Batiscan village.

The river at Citrouille point takes a westerly direction for about $3\frac{1}{2}$ miles to Champlain village, and thence a southwesterly direction for 10 miles to Three Rivers. There is a cutting, $27\frac{1}{2}$ feet deep, through Pouillier Grandmont, about $\frac{3}{4}$ mile southwestward of Citrouille point; and there is also a cutting Pouillier Carpentier, off Champlain village.

Citrouille Point lightbuoy No. 2 C, moored at the lower end of Pouillier Grandmont cutting, is a red spar, and exhibits an intermittent white light.

Champlain upper range lights.—The front lighthouse is a square white building, lantern roof red, 30 feet high, situated about $\frac{3}{5}$ mile above Champlain Village church, and exhibits, at 40 feet above high water, a fixed white light visible in the line of range, 6 miles.

The rear lighthouse is a square brown skeleton tower with white slatwork on upper portion of side facing channel and a white in-

closed watch room, lantern roof red. It is 95 feet high and situated 265° from the front lighthouse, and exhibits, at 109 feet above high water, a fixed white light visible in the range line, 6 miles.

These two lights in line 265° lead through the 30-foot channel from buoy No. 2 C to just above buoy No. 16 C off Champlain.

The river.—Champlain and Gentilly villages are opposite each other and about 3 miles apart. Gentilly shoal occupies nearly all the southern portion of the river between them. A considerable change takes place here in the character of the country, for the high banks, which form the southern shore of the river westward from opposite Quebec, turn inland and the shores on both sides become low and of an alluvial appearance. A channel 450 feet wide and 30 feet deep has been dredged from Bigot island situated southwestward of Champlain to Becancour bend.

Pouillier Carpentier lightbuoy No. 15 C, moored at the upper end of the cutting above Pouillier Carpentier, is a black spar gas buoy, and it exhibits an intermittent white light.

Champlain range lights.—The front lighthouse, square, white, and 23 feet high, surmounted by a white octagonal lantern, situated 300 yards above Champlain church, exhibits, at 34 feet above high water, a fixed white light visible in the line of range, 4 miles. The rear lighthouse is a brown square skeleton tower with white slat work on upper portion of side facing range line, white inclosed watch room, and white lantern with a red roof. The whole structure is 92 feet high, situated 40° , 675 yards from the front lighthouse, and exhibits a fixed white light visible in the range line, 4 miles.

These lights in line astern 40° lead through the dredged channel from above buoy No. 16 C to buoy No. 20 C, southeastward of Bigot island.

Bigot Island lightbuoy No. 20 C, moored to the southeastward of Bigot island, is a red spar gas buoy, and it exhibits an intermittent white light.

Becancour range lights.—Two white fixed range lights, visible in the range line a distance of 6 miles, are shown to the southward of Becancour point. The front light is shown from a white, square building 34 feet high situated on the flats near the western entrance to the Becancour river. The rear light is shown from a red steel skeleton tower with white slatwork facing range line, 63 feet high, situated 1.1 miles 229° from the front light.

These two lights in line, 229° , lead through the dredged channel from just above buoy No. 20 C to Becancour bend at buoy No. 30 C.

Lightbuoy No. 23 C, situated a little more than $\frac{1}{2}$ mile southward of the western end of Bigot island, is black and exhibits an intermittent white light.

Lightbuoy No. 30 C, on the northeastern side of batture Francœur, is a red spar and exhibits an intermittent white light.

Directions.—From buoy No. 119 Q (see p. 520) swing to the southward and pick up Gentilly range. Get on the range and keep on it until abreast buoy No. 132 Q, southeastward of Batiscan village, when steer 204° until Citrouille Point light bears 323° . Then haul to the westward and get on Champlain upper range; be careful not to cross the range line; and in hauling around Citrouille point to get on the range keep pointed as nearly as possible between buoys No. 2 C and No. 1 C, No. 2 C being a lightbuoy. When on the range keep on it until past buoys No. 15 C and No. 16 C.

After passing buoys Nos. 15 C and 16 C, bend toward buoy No. 17 C, and when Champlain range lights are brought in line astern steer 220° with the range on astern nearly up to lightbuoy No. 20 C. From buoy No. 20 C steer 229° , with the Becancour lighthouses in line, past buoys Nos. 23 C, 25 C, and 27 C. Now steer round batture Francœur, marked by red lightbuoy No. 30 C and red spar buoy No. 34 C, and get quickly on the following range:

Cape Madeleine range lights.—Two white fixed range lights, visible on the range line a distance of 4 miles, are shown from the northern part of cape Madeleine. The front light is shown from a white, square, wooden building, 23 feet high, 680 yards 35° from Cape Madeleine steeple. The rear light is shown from a brown, square, steel framework tower, 63 feet high, with white wood slat work on upper portion of side facing channel, white inclosed upper part, lantern roof red, which is situated 257° , 750 yards from the front light.

These two lights in line 257° lead through Becancour traverse.

Cape Madeleine lower range lights.—The front lighthouse is a white square building, with white octagonal lantern having a red roof, all 30 feet high, situated 400 feet from the river bank on northern shore $2\frac{1}{2}$ miles below Cape Madeleine church, and it exhibits, at 51 feet above high water, a fixed white light, visible in range line 7 miles.

The rear lighthouse is a square, brown, steel skeleton tower, with white wooden slat work on upper portion of side facing channel, white inclosed upper part, red roof on lantern, all 87 feet high, situated 935 yards 43° from front light, and it exhibits, at 108 feet above high water, a fixed white light, visible in the range line 7 miles.

These two lights in line, bearing 43° , a back range, when ascending the river lead through the channel from a point abreast Cape Madeleine Village front light to the bend at the red spar buoy No. 54 C.

Cape Madeleine upper range lights.—This range should not be used by vessels, and is mentioned here simply to prevent its being mistaken for the village or the lower range.

The front lighthouse is situated near the river bank 2 miles below the cape, and is a white octagonal building, 16 feet high, which exhibits, at 40 feet above high water, a fixed white light, visible in the line of range 6 miles.

The rear lighthouse is a white octagonal building, 40 feet high, situated 285 yards 249° from the front lighthouse, and exhibits, at 55 feet above high water, a fixed white light, visible in the line of range 6 miles.

These two lights in line are used to clear Provencher shoal, using the north channel, but they are not used in ordinary navigation of the river.

Lightbuoy No. 39 C, at the western end of Becancour traverse, is a black spar and exhibits an intermittent white light.

The river channel from lightbuoy No. 39 C passes between Tau-reau shoal, on which there is a depth of 19 feet, and a shoal southward of it, and continues southwestward to Three Rivers.

Lightbuoy No. 43 C, situated eastward of Cape Madeleine front light, is a black spar and exhibits an intermittent white light.

Lightbuoy No. 55 C, situated southeastward of Cochon island, is black and exhibits an intermittent white light.

Three Rivers shoal lies about 400 yards off the town and extends a little more than $\frac{1}{2}$ mile northeast and southwest, with a width of 300 yards; the ship channel passes on its northwestern side, which is marked by black spar buoy No. 57 C, on the northern edge of the shoal, and by black lightbuoy No. 59 C, which exhibits an intermittent white light, on its upper end.

Three Rivers town, the capital of St. Maurice county and one of the oldest towns in the province, being founded in 1618, is situated on the north shore of the St. Lawrence and on the southwestern side of the entrance of St. Maurice river. It contains a Roman Catholic cathedral, several churches, a college, a convent, two banks, two printing offices, and supports two weekly newspapers. Its population in 1901 was 9,981.

Trade.—The principal exports are lumber, wood pulp, and paper. The Laurentide company at Grande Mere, near Three Rivers, are making 125 tons of paper and 50 tons of cardboard from wood pulp daily.

Wharves.—There is a depth of 30 feet at the wharves, where there are facilities for loading and unloading. There is a deep-water wharf with a frontage of 1,968 feet on the river side and an ice breaker of timber at its upper end to afford protection from ice.

Communication.—Three Rivers town is connected with Quebec and Montreal by the North Shore (Canadian Pacific) railway, and Doucet, on the opposite shore of the river, is connected to Arthabaska by a branch of the Grand Trunk, the main line of which touches Arthabaska. The Richelieu and Ontario company's steamers, running between Quebec and Montreal, call daily.

The river from Three Rivers takes south-southwesterly and southwesterly directions for $5\frac{3}{4}$ miles, above which the channel, part of it dredged, passes between Force and Iron shoals, on the north, and Outardes shoal on the south, for 1 mile into lake St. Peter.

Port St. Francis range lights.—The front lighthouse, a white, octagonal building, 18 feet high, is situated on St. Francis wharf, at about $5\frac{1}{4}$ miles above Three Rivers town, and it exhibits, at 14 feet above high water, a fixed white light visible 4 miles on the range line.

The rear lighthouse, a brown, square, skeleton tower, with white slat work on its western side, 31 feet high, on a pier 62° , 183 yards from the preceding lighthouse, exhibits, at 36 feet above high water, a fixed white light, visible 11 miles from all directions of approach.

These lights in line lead from southward of Force shoal to southward of Iron shoal.

Lightbuoy No. 6 L, moored southward of Force shoal, is a red spar buoy showing on intermittent white light.

Lake St. Peter.—The distance up this lake from point du Lac, which is westward 1.9 miles from Port St. Francis wharf, to Richelieu islands is about 18 miles, of which about 4 miles are over a flat of sand and clay, on which there is a depth of $10\frac{1}{2}$ feet at the low water in autumn. A ship channel, 450 feet wide, with a depth of 30 feet in it at ordinary low water, has been dredged through the lake.

Nicolet traverse commences at about 1,200 yards westward from buoy No. 10 L, and it is about 1 mile in length, whence the channel turns to a direction westward of southwest through the lower pool.

Nicolet range lights.—The front lighthouse is a white, square building on a pier situated on the flats on the east side of the mouth of the river Nicolet; the building is 19 feet high, and exhibits, at 45 feet above high water, a fixed white light visible in the line of range 4 miles.

The rear lighthouse is a brown, square skeleton tower, with white wooden slat work on upper portion of side facing the channel, surmounted by white wooden watch room, and octagonal lantern. The building is 82 feet high, situated 1,417 yards, 108° from the front light, and exhibits, at 96 feet above high water, a fixed white light visible in the line of range 5 miles.

The two lights in line lead through the dredged channel in Nicolet Traverse on a course 288° from black gas buoy No. 13 L to black gas buoy No. 17 L.

Nicolet Traverse lightbuoys.—No. 13 L is a black cylindrical buoy, moored at the lower end of Nicolet traverse and showing an intermittent white light.

No. 17 L is a similar buoy showing a similar light and moored at the upper end of the traverse.

Point du Lac range lights.—The front lighthouse is a square white building with a red roof, surmounted by a red lantern, the whole 27 feet high, situated on a pier on the northern edge of the curve in lake St. Peter above Point du Lac, and exhibits at 45 feet above high water, a fixed white light, visible 12 miles.

The rear lighthouse is a brown, square skeleton steel tower, surmounted by an inclosed white watch room and a red lantern, all 102 feet high, situated 55° , $1\frac{1}{2}$ miles from the front light, and exhibits, at 137 feet above high water, a fixed white light, visible 17 miles.

The lights in line astern bearing 55° lead from the curve in lake St. Peter, above Point du Lac, to lightbuoy No. 57 L, at Yamachiche bend.

Lightbuoy No. 25 L is a black steel cylindrical buoy, moored at the upper end of the curve just above Point du Lac, showing an intermittent white light.

Lightbuoy No. 41 L is a black steel cylindrical buoy showing an intermittent white light, moored on the southeastern side of the cut, opposite Yamachiche point.

Yamachiche Bend lightbuoy No. 57 L is a black cylindrical gas buoy, which shows an intermittent white light, thus: Light, 10 seconds; eclipse, 10 seconds; moored at Yamachiche bend, with Yamachiche church bearing 351° distant 4.3 miles.

Anchorage.—Anchorage for the accommodation of heavy draft vessels has been formed by widening the curve opposite the lightbuoy No. 57 L. For a distance of 2,800 feet on each side of the lightbuoy the channel is dredged to a depth of 30 feet, lowest water of 1897, and to a width of 450 feet at the extremities, gradually increasing to 800 feet opposite the lightbuoy, the northern boundary of the dredged triangle being a tangent 5,600 feet long. Buoys mark the limits of the anchorage, red spar buoy No. 56 L being moored 800 feet opposite the lightbuoy.

Lightbuoy No. 79 L is a black cylindrical buoy showing an intermittent white light, moored at the lower end of curve No. 2, marking the point to leave Lake St. Peter downstream range and take the curve to get on curve No. 2 upstream range.

Lake St. Peter Curve No. 2 range lights.—The front lighthouse, common to two ranges, the downstream and the upstream, is a red octagonal lantern rising from red roof of a square white dwelling, on a pier 2.2 miles south-southeastward of the mouth of rivière du Loup. The building is 28 feet high and exhibits, at 49 feet above high water, a fixed white light, visible 6 miles.

The rear lighthouse of the downstream range is a red, square, skeleton tower rising from the walls of a white dwelling standing on a pier 667 yards, 248° , from the front lighthouse, the whole surmounted by a red octagonal lantern. The whole building is 73 feet high and exhibits, at 94 feet above high water, a fixed white light, visible 6 miles.

These two lights in line, 248° , lead from lightbuoy No. 57 L to lightbuoy No. 79 L.

The rear lighthouse of the upstream range is an exactly similar structure to the rear lighthouse of the downstream range, and it exhibits, at 94 feet above high water, a fixed white light, visible 6 miles. It is situated 42° , 667 yards from the front lighthouse.

This light in line astern with the front light bearing 42° leads from lightbuoy No. 85 L at the upper end of curve No. 2 to the intersection of the range line with the range line of Ile aux Raisins range lights off West lightship No. 1.

Louiseville range lights.—A pole 20 feet high, with white diamond-shaped slatwork attached, situated on western side of rivière du Loup about $\frac{1}{4}$ mile above its mouth, exhibits, from a lantern 25 feet above high water, a fixed white light, visible in line of range 6 miles.

A similar pole, 40 feet high, situated 200 yards, 345° , from the front pole, exhibits, from a lantern 45 feet above high water, a fixed white light visible in the line of range 6 miles.

The two lights in line, 345° , lead into rivière du Loup from lake St. Peter.

Lightbuoy No. 85 L is a black, steel, cylindrical buoy showing an intermittent white light, moored at the upper end of curve No. 2, and marking the point where it is necessary to be on Lake St. Peter curve No. 2, upstream range.

Lightbuoy No. 97 L is a black, steel, cylindrical buoy showing an intermittent white light, moored at the lower end of curve No. 1, where it is necessary to take the curve for getting on Ile aux Raisins range.

Lightbuoy No. 103 L is a black, steel, cylindrical buoy showing an intermittent white light, moored at the upper end of curve No. 1, where it is necessary to be on Ile aux Raisins range.

Western lightvessel No. 1, painted red with "No. 1" in white letters on her sides, and having a white octagonal tower with a red

lantern roof amidships, is moored at a bend of the channel, where the channel takes or leaves Ile aux Raisins range, and about 2.6 miles, 223° , from Lake St. Peter Curve No. 2 range lights, and exhibits, at 22 feet above high water, 2 fixed white lights, visible 9 miles.

St. Francis River lights.—Two masts placed off the mouth of St. Francis river, the outer one being on the northeastern end of a low grassy islet, exhibit a fixed white and a fixed red light respectively, visible 4 miles, to guide vessels into the river.

Ile aux Raisins range lights.—The front lighthouse, on a pier on the northern side of the island, is white, square, surmounted by a square white lantern with a red roof and 22 feet high; it exhibits, at 36 feet above high water, a fixed white light, visible 7 miles.

The rear lighthouse on the southwestern side of the island at 191° , 671 yards from the front light, is a brown, square, skeleton tower, surmounted by a white watch room and lantern, 85 feet high, which exhibits, at 86 feet above high river, a fixed white light, visible 7 miles.

The alignment of these lighthouses leads from Western lightvessel through the dredged channel into deep water at the upper end of the lake.

Directions (see p. 523).—Proceeding through Becancour traverse on Cape Madeleine range, steer on the range 257° to lightbuoy No. 39 C; and thence swing to the southward, keeping lightbuoy No. 43 C on the port bow. When past this buoy, get on Cape Madeleine lower range astern and steer on it 223° to buoy No. 54 C east of isle aux Cochons. Leaving this buoy on the starboard hand, steer 236° , leaving buoy No. 57 C on the port hand. Thence steer past the town of Three Rivers, to leave buoy No. 59 C on the port hand, and from that buoy steer 209° until opposite Hanson point, when steer in mid-channel around the bend, and then continue in mid-channel 233° , pointed fairly between buoys No. 5 L and No. 6 L, the latter being a lightbuoy. When past buoy No. 6 L, get on Port St. Francis range, and keep the range on astern, steering 242° around Force shoal, leaving buoy No. 8 L on starboard hand, and steer for buoy No. 13 L, keeping it a little on the port bow. By the time this buoy is reached get well on Nicolet back range and keep it on astern, steering 287° through Nicolet traverse, nearly to buoy No. 20 L. Just before reaching this buoy steer to the southward, leaving buoys No. 19 L and No. 21 L on the port hand, and steering so as to bring Point du Lac range on astern above buoy No. 23 L. Keep the range on astern, steering 235° to lightbuoy No. 57 L, at Yamachiche bend. Leaving this buoy on the port hand, take Lake St. Peter curve No. 2, downstream range ahead, and keep it on a course 248° to lightbuoy No. 79 L, whence take the curve, keeping between the buoys, to light-

buoy No. 85 L. Leaving this buoy on the port hand, bring on astern Lake St. Peter curve No. 2, upstream range, and keep it, steering 222° to lightbuoy No. 97 L, whence take the curve, keeping between the buoys, and leaving the lightship on the starboard hand, to lightbuoy No. 103 L. At this buoy take Ile aux Raisins range 191° ahead, through the dredged channel at upper end of lake St. Peter.

These directions must be followed closely, because the dredged channel is only 450 feet wide; therefore the ranges must be taken and left quickly. The channel is so well buoyed, however, that with ordinary care it is not easy to go wrong.

The ship channel at the upper end of lake St. Peter passes northwestward of ile aux Raisins, between Stone and Boat islands, and southward of iles de Grace and St. Ignace. On the southern side of the channel and at $2\frac{1}{4}$ miles above isle de Grace is the town of Sorel.

This and the succeeding parts of the navigation must be carefully attended to; the river is divided into numerous channels and the buoys and ranges are the only guides to the correct one.

Anchorage.—There is limited anchorage space in 6 and 7 fathoms, southeastward of Flat island, with black buoy No. 113 L bearing 144° , distant 300 yards, and Ile aux Raisins front light bearing 166° , distant $\frac{3}{4}$ mile.

Range lights—Ile du Moine lower range.—The front lighthouse is a square white building surmounted by a lantern with a red roof, all 19 feet high and built on a pier 24 feet high, situated on Boat island (ile du Barques), about 1 mile from its eastern end. The lighthouse exhibits at 41 feet above high water a fixed white light, visible in the range line 10 miles.

The rear lighthouse is a square brown skeleton tower with white slat work on upper portion of side facing channel; white inclosed upper part, and lantern roof red, all 86 feet high. The tower stands on a pier 19 feet high, situated on ile du Moine, 219° , 3,230 yards from the front light, and exhibits, at 108 feet above high water, a fixed white light visible in the line of range 5 miles.

These two lights in line 219° lead from the intersection of their range line with Ile aux Raisins range, $\frac{1}{4}$ mile above lightbuoy No. 111 L, to the intersection of their range line with Gallia Bay upper range just above buoy No. 120 L.

The rear light of this range is also the rear light of Ile du Moine upper range.

Gallia Bay upper range.—The front lighthouse, a square white building, surmounted by a square white lantern, with a red roof, all 19 feet high, standing on a pier, on the southern side of Stone island

(ile a Lapierre), equidistant from its eastern and western ends, exhibits, at 41 feet above high water, a fixed white light, visible, in the range line, 2 miles.

The rear lighthouse is a white cylindrical steel tower, 5 feet in diameter, surmounted by a red square wooden lantern, all 52 feet high, standing on a concrete pier, 220 yards, 249° , from the front light, and it exhibits, at 73 feet above high water, a fixed white light, visible, in the line of range, 2 miles.

These lights in line, 249° , lead up from the intersection of their range line with that of Ile du Moine lower range, near buoy No. 120 L, to the intersection of their range line with Gallia Bay lower range line just westward of lightbuoy No. 123 L.

Gallia Bay lower range.—The front lighthouse is a square white wooden building, surmounted by a square white lantern, with a red roof, all 19 feet high, standing on a concrete pier, on the southern side of Stone island, about 1 mile from its eastern end, and it exhibits, at 38 feet above high water, a fixed white light, visible, in the line of range, 2 miles.

The rear lighthouse, a white cylindrical steel tower, 5 feet in diameter, surmounted by a square red lantern, all 52 feet high, standing on a pier 200 yards, 30° , from the front light, exhibits, at 71 feet above high water, a fixed white light, visible, in the range line 2 miles.

These lights in line 30° astern lead up from the intersection of their range line with Gallia Bay upper range just west of lightbuoy No. 123 L, to the intersection of their range line with Ste. Anne de Sorel range at the bend off the southeastern point of ile a Lapierre.

Ste. Anne de Sorel range.—The front lighthouse, a square white building surmounted by a square red lantern, all 19 feet high, stands on a concrete pier, on the southern shore of the St. Lawrence, about $2\frac{1}{4}$ miles below Sorel, and exhibits, at 35 feet above high water, a fixed white light, visible, in the line of range 2 miles.

The rear lighthouse, a brown square steel skeleton tower, with white wooden slat work on upper portion of side facing channel, white inclosed watch room, and lantern roof red, the whole being 80 feet high, stands 723 yards, 235° , from the front lighthouse and exhibits at 98 feet above high water, a fixed white light, visible, in the line of range 5 miles.

These two lights in line, 235° , lead up from the intersection of their range line with Gallia Bay lower range, at the bend off the southeast point of ile a Lapierre, nearly to the intersection of their range line with Ile du Moine upper range near lightbuoy No. 136 L.

Ile du Moine upper range.—A square white building 21 feet high, surmounted by a square white lantern, standing on a square

concrete pier 25 feet high, on the southwestern end of ile du Moine, exhibits, at 43 feet above high water, a fixed white light, visible in the line of range 5 miles.

The rear light is a fixed white light, visible in the line of range 5 miles, and is exhibited from a square brown skeleton tower standing 530 yards, 83° , from the front lighthouse. It is also the rear lighthouse of Ile du Moine lower range, and is described on p. 529.

These two lights in line astern 83° lead up through the dredged channel from the curve below Ste. Anne de Sorel at lightbuoy No. 136 L to the intersection of their range line with Ile de Grace range at Nepigon Shoal lightbuoy No. 146 L.

Ile de Grace range.—The front lighthouse, a square white building having a steel frame sheathed with asbestos, surmounted by a square white lantern, all 19 feet high, standing on a square concrete pier with sloping sides, on the southern side of ile de Grace, exhibits, at 36 feet above high water, a fixed white light, visible in the line of range 5 miles.

The rear light is exhibited from a square brown skeleton tower, with white, wooden slatwork on upper portion of side facing channel; white, inclosed watch room and a white, square lantern with a red roof, the whole 63 feet high. The tower stands on the southeastern end of ile de Grace, 633 yards, 75° , from the front lighthouse, on a concrete pier with sloping sides and pointed upstream end. The light is fixed white, exhibited at 80 feet above high water, and visible in the range line 5 miles.

These two lights in line astern 75° lead up from the intersection of their range line with Ile du Moine upper range at Nepigon Shoal lightbuoy No. 146 L to near the western end of ile St. Ignace, where the river turns abruptly southward.

Lightbuoys.—No. 111 is a steel cylindrical buoy showing an intermittent white light, moored in Ile aux Raisins traverse near the intersection of Ile aux Raisins range with Ile du Moine lower range.

No. 123 L is a black steel spar showing an intermittent white light, moored off pointe aux Soldats, near the intersection of Gallia Bay upper and lower ranges.

No. 136 L is a red steel spar showing an intermittent white light, moored southward of ile de Grace, northward of the intersection of Ile du Moine upper and Ste. Anne de Sorel ranges.

No. 146 L is a red steel spar showing an intermittent white light, moored on Nepigon shoal just north of the intersection of Ile de Grace and Ile du Moine upper ranges.

Sorel town, on the right bank of Richelieu river entrance, on the southern shore of the St. Lawrence, contains manufactories of engines, mill and agricultural machinery, leather, bricks, etc.; saw and

grist mills; has two weekly newspapers, two banks, several hotels, three or four churches, and a number of stores. The population in 1901 was 7,057.

Sorel is connected with Montreal by the South Shore railway. A branch of the Canadian Pacific railroad ends at the town, and a railroad runs from it to St. Hyacinthe, where there is a junction with the Grand Trunk railroad.

Anchorage.—There is anchorage for heavy draft vessels off Sorel, to the southward of Ile de Grace range line, and either eastward or westward of Richelieu river entrance, the better position being to the eastward.

Richelieu river flows past the western side of Sorel town into the St. Lawrence. At about 35 miles southward of its entrance it expands into Chambly basin, and at the head of the river, 80 miles from the entrance, is lake Champlain. The river forms an important part of the navigation between St. Lawrence and Hudson rivers.

There is a depth of 4 to 5 fathoms for about 2 miles within the mouth of the river, and it is a good and safe place for vessels to winter in, and they are sometimes sent here from Montreal for that purpose.

Range lights.—A fixed red gaslight is shown from each of two red, steel skeleton lighthouses, 35 and 50 feet high, on the wharves at Sorel and on the eastern side of the river's mouth, which in line 171° lead into the river, but through a channel suitable only for vessels of light draft.

Range beacons.—Two diamond shaped beacons on the western side of the river's mouth, in line bearing 203° , lead into the river in a least depth of 24 feet.

Richelieu and Champlain navigation.—The system of navigation between river St. Lawrence and lake Champlain, commencing at Sorel, extends along Richelieu river, through St. Ours lock to Chambly basin, thence by Chambly canal to St. Johns, and down Richelieu river to lake Champlain. The southern end of lake Champlain is entered at Whitehall, and connection is obtained with Hudson river, by which the city of New York is directly reached.

The distances are: Sorel to St. Ours lock, 14 miles; St. Ours lock to Chambly canal, 32 miles; Chambly canal, 12 miles; Chambly canal to U. S. boundary line, 23 miles; boundary line to Champlain canal, southern end of lake Champlain, 111 miles; Champlain canal to junction with Erie canal, 66 miles; Erie canal from junction to Albany, 7 miles; Albany to New York, via Hudson river, 146 miles; total distance, 411 miles. The above are statute miles.

At St. Ours, Richelieu river is divided by a small island into two channels. St. Ours lock is in the eastern channel; it is 200 feet long,

45 feet wide, has 5 feet rise or lockage, and a depth of 7 feet on the sills at low water. The length of the dam in the eastern channel is 300 feet, and that in the western channel 690 feet.

There is a navigable depth in the Richelieu of 7 feet, between St. Ours lock and Chambly basin.

Chambly canal succeeds the 32 miles of navigable water between St. Ours lock and Chambly basin; it overcomes the rapids between Chambly and St. Johns. The canal is 12 miles long, with a width of 60 feet at surface, and 36 feet at bottom; there are 9 locks, of which the smallest is 118 feet long and $22\frac{1}{2}$ feet wide, with 7 feet water on the sills, and a rise or lockage of 74 feet.

The number of vessels passed through Chambly canal during 1900 was 2,841 of an aggregate tonnage of 300,755 tons.

St. Lawrence river continues westward for about a mile above Sorel; it then takes nearly a southerly direction, and is clear and deep in the fairway southward to Lanoraie, a distance of 6 miles, above which the ship channel passes through dredged cuttings between ile St. Ours and the land eastward of it, and between the shoals off Lavaltrie and Contrecoeur.

Ile du Pads range lights.—The front lighthouse, a square white building, surmounted by a square white lantern, all 19 feet high, stands on the eastern side of Ile aux Cochons, on a concrete pier 22 feet high, square, with battered sides. The lighthouse exhibits at 39 feet above high water a fixed white light, visible 6 miles in the range line.

The rear lighthouse, a brown square steel skeleton tower, with white wooden slat work on upper part of side facing channel inclosed white upper part and white lantern, with a red roof, all 69 feet high, stands on the southwestern end of Ile du Pads, 15° , 653 yards from the front lighthouse. It exhibits at 71 feet above high water a fixed white light, visible in the line of range 6 miles.

The two lights in line astern 15° lead up from the upper end of Ile aux Foins to the intersection of their range line with that of Lavaltrie range, or to mid-channel abreast a windmill on the eastern shore of the river.

Lavaltrie range lights.—A white lighthouse, with red vertical stripes on sides facing up and down stream, 13 feet high, on a small pier on the southeastern side of Lavaltrie island, exhibits, at 17 feet above high water, a fixed white light visible 8 miles.

A square, red, open steel frame lighthouse, with a red lantern and white slatwork target, with vertical red stripe, 32 feet high, on a small pier, 320 yards 207° from the front light, exhibits, at 33 feet above high water, a fixed white light, visible 10 miles.

These two lights in line 207° lead up from the intersection of this range with Ile du Pads range, to $\frac{1}{4}$ mile below lightbuoy No. 5 M., and thence through Flat Islands channel.

Caution.—This range can not be used by deep draft vessels beyond the point $\frac{1}{4}$ mile below lightbuoy No. 5 M. Such vessels must take St. Ours Traverse range at that point.

The river from lightbuoy No. 5 M, northward of ile St. Ours, all the way to Montreal, takes a southerly direction and is divided by numerous islands into two or more channels. Therefore the buoys and range lights must be carefully followed.

Ile aux Foins lightbuoy No. 1 M, is a black cylindrical buoy, showing an intermittent white light, moored at the upper end of the curve at Ile aux Foins.

St. Ours lightbuoy No. 5 M, situated a little more than $\frac{3}{4}$ mile 168° from Lanoraie wharf, is a black spar gas buoy, which exhibits an intermittent white light, thus: Light, 7 seconds; eclipse, 5 seconds.

St. Ours Traverse range lights.—The front lighthouse, on the beach on the eastern shore of the river at 1.1 miles above the southern end of ile St. Ours, is white, square, 33 feet high, with a red roof, and it exhibits, at 50 feet above high river, a fixed white light, visible 4 miles in the range line.

The rear lighthouse, on the river bank at 181° , 900 yards from the front lighthouse, is a brown, square, skeleton tower, 64 feet high, with a white slatwork on the upper part of side facing channel, and an inclosed white upper part with a red roof, which exhibits, at 87 feet above high river, a fixed white light, visible 4 miles in the range line.

These lights in line lead up from lightbuoy No. 5 M to Bellmouth curve.

Bellmouth Curve lightbuoys—**No. 16 M** is a red spar, moored at the lower end of Bellmouth curve and exhibits an intermittent red light.

No. 20 M, situated at the middle of Bellmouth curve, is a red spar gas buoy, which exhibits a fixed red light.

No. 24 M is a red spar, moored at the upper end of Bellmouth curve, and exhibits an intermittent red light.

Petite Traverse range lights.—The front lighthouse, on the river bank east of the southern end of ile St. Ours, is square, white, with a red lantern roof, 33 feet high, and exhibits a fixed white light, visible 4 miles in the range line.

The rear lighthouse, at 47° , 610 yards from the front light, is a brown, square, skeleton tower, 64 feet high, with a white slatwork on upper part of side facing channel, and an inclosed white upper part

with a red roof, which exhibits, at 117 feet above high river, a fixed white light, visible 5 miles in the range line.

These lights in line astern 47° lead through Petite traverse from Bellmouth curve to black lightbuoy No. 31 M.

Contrecœur Bend lightbuoy No. 31 M is moored at the western end of Petite traverse and the northeastern end of Contrecœur course; it is a black steel spar buoy which exhibits an intermittent white light, thus: Light, 7 seconds; eclipse, 5 seconds.

Contrecœur Course range lights.—The front lighthouse, on the river bank eastward from the northern end of ile St. Ours, is white, square, with a red lantern roof, and 33 feet high; it exhibits, at 63 feet above high river, a fixed white light, visible 5 miles in the range line.

The rear lighthouse, situated 33° , 852 yards from the front lighthouse, is a brown, square, skeleton tower, with white slatwork on the upper part of side facing channel, and an inclosed white upper part, with a red roof, and 64 feet high; it exhibits, at 127 feet above high river, a fixed white light visible 5 miles in the range line.

These lights in line astern, 33° , lead through Contracœur course from lightbuoy No. 31 M to lightbuoy No. 45 M, where this range intersects Contracœur Traverse range.

Contrecœur Junction lightbuoy No. 45 M, moored at the southwestern end of Contrecœur course and the northern end of Contrecœur Traverse dredged channel, is a black gas buoy showing an intermittent white light, thus: Light, 6 seconds; eclipse, 5 seconds.

Contrecœur Traverse range lights.—The front lighthouse, situated 227° , $2\frac{1}{8}$ miles from Contrecœur church, is square, white, 27 feet high, on a concrete pier, and it exhibits, at 35 feet above high river, a fixed white light, visible 6 miles in the range line.

The rear lighthouse, situated 194° , 703 yards from the front lighthouse, is a brown, square, skeleton tower, with white slatwork on the upper part of side facing channel, and an inclosed white upper part with a red roof, 64 feet high; and it exhibits, at 95 feet above high river, a fixed white light visible 6 miles in the range line.

These lights in line, 194° , lead through Contrecœur traverse from lightbuoy No. 45 M, until Contrecœur beacon towers lights or Verchères Village range lights are in line.

Contrecœur Towers range lights.—A square white tower, 38 feet high, with a red roof, is situated on the flats off Contrecœur village, with Contrecœur church bearing 123° , distant $\frac{3}{4}$ mile nearly; it exhibits at 31 feet above high river, a fixed white light, visible 6 miles in the range line.

A square skeleton tower, 68 feet high, with a white slatwork upper part on side facing channel, stands on an island at 40° , $1\frac{1}{2}$ miles

from the preceding tower; it exhibits a fixed white light, visible 6 miles in the range line.

Verchères Village range lights.—The front lighthouse, situated 104° , 127 yards from Verchères wharf, is white, square, with a red roof, and 31 feet high, it exhibits, at 44 feet above high river, a fixed white light, visible 12 miles in the range line.

The rear lighthouse, situated 220° , 650 yards from the front lighthouse, is a brown, square, skeleton tower, with an inclosed white upper part and a red lantern roof; it exhibits, at 85 feet above high river, a fixed white light, visible 15 miles in the range line.

Verchères Village range lights in line ahead 220° or Contrecoeur Towers range lights in line astern 40° lead through the dredged channel between Contrecoeur and Verchères traverses from buoy No. 49 M to lightbuoy No. 82 M.

Plum Island lightbuoy No. 82 M, moored off the upper end of ile aux Prunes (Plum island), is a red, steel spar showing an intermittent red light.

Verchères Traverse range lights.—The front lighthouse, situated 43° , 2,857 yards from Verchères church, is square, white, with a red lantern roof and 23 feet high; it exhibits, at 36 feet above high river, a fixed white light, visible 11 miles in the range line.

The rear lighthouse, situated 55° , 633 yards from the front lighthouse, is white, circular, lantern white, octagonal, with a red roof, all 41 feet high, and it exhibits, at 43 feet above high river, a fixed white light, visible 12 miles in the range line.

These lights in line lead through the channel from the alignment of Verchères Village range lights at lightbuoy No. 82 M to the alignment of Ile Bouchard range lights at lightbuoy No. 89 M.

Ile Bouchard range lights.—The front lighthouse, situated on a cribwork pier off the eastern end of ile Marie, is square, white, with a red lantern roof, 28 feet high, and it exhibits, at 39 feet above high river, a fixed white light, visible 8 miles on the range line.

The rear lighthouse, on the southeastern coast of ile Bouchard, opposite the lower end of Plum island, and 37° , 2,733 yards from the front light, is a brown, square, skeleton tower, with an inclosed white upper part and a red lantern roof, 65 feet high; it exhibits, at 75 feet above high water, a fixed white light, visible 8 miles in the range line.

Verchères lightbuoy No. 89 M is moored on the southeastern side of the channel at about $\frac{1}{4}$ mile above Verchères point; it is a black spar buoy, and it exhibits an intermittent white light.

Ile Delorier range lights.—The front lighthouse, situated on a cribwork pier on the eastern coast of ile Delorier, is white, square,

with a red lantern roof, 19 feet high, and it exhibits, at 37 feet above high river, a fixed white light, visible 11 miles.

The rear lighthouse, on the eastern coast of ile Ste. Thérèse at nearly 1,200 yards from its northern end and 3,140 yards 217° from the front light, is a brown, square, skeleton tower, with an enclosed white upper part, and a red lantern roof, all 65 feet high; it exhibits, at 73 feet above high river, a fixed white light, visible 14 miles in the range line.

Ile Delorier range lights in line ahead 217° , or Ile Bouchard range lights in line astern 37° , lead through the channel from the alignment of Verchères Traverse range lights to lightbuoy No. 117 M.

Directions.—(See p. 529.)—Steer on Ile Aux Raisins range 191° , through the dredged channel at the upper end of lake St. Peter, to a little above black lightbuoy No. 111 L, and begin to haul to the westward for Ile du Moine lower range, which should be well on at $\frac{1}{2}$ mile above the buoy. Steer on this range 219° to buoy No. 120 L, and there swing around the bend, keeping the lead going, and get on Gallia Bay upper range. Steer on this range 249° nearly up to lightbuoy No. 123 L, but commence to swing to the southward just before reaching the buoy in order to bring Gallia Bay lower range on astern by the time the buoy is passed. Get the range quickly and keep it on astern, steering 210° until Ste. Anne de Sorel range is nearly on ahead 235° .

Keep Ste. Anne de Sorel range on until lightbuoy No. 136 L bears 270° , when steer to the westward around the buoy and bring on astern Ile du Moine upper range, steering 263° nearly up to lightbuoy No. 146 L. Just before reaching the buoy steer a little to the southward, so as to bring Ile de Grace range on astern 75° just beyond the buoy. Keep Ile de Grace range on astern until Ile du Pads front light bears 314° , when commence the turn around the bend above Sorel; make the turn, of course keeping lightbuoy No. 1 M on the port bow. By the time the buoy is reached and the turn completed, Ile du Pads range should be on astern.

Keep Ile du Pads range on astern, steering 195° until abreast a windmill on the eastern shore of the river, when steer 206° with lightbuoy No. 5 M on the port bow. Instead of steering this course, an alternative is to keep Ile du Pads range on astern until Lavaltrie range comes nearly on, and then take that range. But as the intersection of these ranges is nearly at the limit of visibility of Lavaltrie range, the latter may be difficult to pick up. The fairway of the river is clear and wide and the first direction is therefore probably preferable. In either case, when about $\frac{1}{4}$ mile below lightbuoy No. 5 M, steer to the southward, bring on St. Ours Channel range ahead,

and steer on it 181° to lightbuoy No. 16 M. Now steer around Bellmouth curve, keeping between the buoys, and bring on astern Petite Traverse range, bearing 47° as near buoy No. 23 M as possible. Keep on this range, steering 227° nearly up to lightbuoy No. 31 M. Just before reaching this buoy, steer so as to bring on astern Contrecoeur Course range, and keep on it, steering 213° until nearly up to lightbuoy No. 45 M, and then bring on ahead Contrecoeur Traverse range, bearing 194° .

Contrecoeur traverse is less than 1 mile long, and the ship must therefore be handled quickly. Steer on Contrecoeur Traverse range, to within about 200 yards of buoy No. 49 M, whence steer to the westward and swing gradually on to Verchères Village range ahead or Contrecoeur Towers range astern. Steer on either range, 220° , nearly up to lightbuoy No. 82 M, where bring on astern Verchères Traverse range, keeping on it through Verchères traverse, past the village to lightbuoy No. 89 M. At the buoy swing on to ile Delorier range ahead or ile Bouchard range astern.

It must be remembered that at many of the turns the channel is narrow and the turns must be quickly made. The seaman must be well acquainted with the steering and speed qualities of his ship, and must handle her according to his best judgment.

Cape St. Michael lightbuoy No. 117 M, situated on the southeastern side of the channel eastward of the northern end of ile Delorier, is a black spar buoy, which exhibits an intermittent white light.

Ile Delorier lightbuoy No. 124 M, situated 300 yards southward of the southern part of Delorier island, is a red spar buoy and it exhibits a fixed white light.

Repentigny range lights.—Two fixed white lights are exhibited from two white lighthouses at Repentigny which, in line lead through Isle Bague channel. But this channel is not suitable for vessels of heavy draft.

Isle Bague light.—A white octagonal lighthouse on isle Bague exhibits, at 24 feet above high river, a fixed white light visible 4 miles.

Ile Ste. Thérèse lower range lights.—The front lighthouse, on the eastern coast of ile Ste. Thérèse at about $\frac{3}{4}$ mile from its northern end is white, with a red roof, on an open post foundation, and 16 feet high; it exhibits, at 22 feet above high river, a fixed white light, visible 10 miles over a small arc on each side of the range line.

The rear lighthouse, situated 200 yards 217° from the front lighthouse, is square, white, with a red roof, and 42 feet high; it exhibits, at 48 feet above high river, a fixed white light, visible 12 miles over a small arc on each side of the range line.

These lights in line lead through the dredged channel from lightbuoy No. 124 M up to Varennes curve.

Boucherville range lights.—Two masts on the northern end of isle St. Joseph exhibit two fixed white lights, which lead from Varennes into Boucherville channel. The masts have black diamond shapes attached to them.

Caution.—Be careful not to get these lights mixed with any of the ship channel range lights.

Varennes Curve light buoy No. 129 M, moored at the lower end of the curve is a black steel spar, showing an intermittent white light.

Varennes Curve light buoy No. 133 M, moored in the middle of the curve 1,200 yards northwestward from Varennes church, is a black spar buoy, exhibiting an intermittent white light.

Ile à l'Aigle range lights.—The front lighthouse, situated on the western coast of the isle near its northern end, is a white pentagonal lantern on a concrete pier, 30 feet high, and it exhibits a fixed white light, visible 2 miles on the range line.

The rear lighthouse, situated on the eastern coast of the island at 183° , 515 yards from the front lighthouse, is a square white tower on a concrete pier, 52 feet high, and it exhibits a fixed white light, visible 2 miles on the range line.

These lights in line 83° lead through the channel from lightbuoy No. 133 M to abreast the lower end of ile au Beurre.

The ship channel then passes between iles Ste. Thérèse and aux Vaches, on the northwest, and ile à l'Aigle on the southeast.

Ile aux Vaches Traverse range lights.—The front lighthouse is the front lighthouse of Ile à l'Aigle range.

The rear lighthouse, situated in Varennes village at 34° 1,887 yards from the front lighthouse, is a red skeleton tower, with white slat-work on upper portion of side facing channel, and an inclosed white upper part 61 feet high, and it exhibits, at 80 feet above high river, a fixed white light, visible 4 miles on the range line.

These lights in line astern, 34° , lead up from the bend below Ile aux Vaches light to the alignment of Ste. Thérèse upper range lights, or to lightbuoy No. 149 M.

Pointe aux Trembles Bend lightbuoy No. 149 M, moored at a bend in the channel and northeastward nearly 1 mile from Point aux Trembles church, is a black spar gas buoy, exhibiting an intermittent white light.

Ile Ste. Thérèse upper range lights.—The front lighthouse, situated on the southeastern coast of ile aux Vaches, is white octagonal, 17 feet high, and on a concrete pier; it exhibits, at 32 feet above high river, a fixed white light, visible 4 miles on the range line.

The rear lighthouse, on the southeastern coast of Ste. Thérèse island at 25° , 1,677 yards from the front lighthouse, is square, 71 feet high, and consists of an open framework of red steel, with wooden white slats on the upper portion of the side facing the range, surmounted by an inclosed watch room and a lantern, all built on a concrete pier; it exhibits, at 84 feet above high river, a fixed white light, visible 4 miles on the range line.

These lights in line astern, 25° , lead through the dredged channel off pointe aux Trembles, from lightbuoy No. 149 M to buoy No. 163 M, at the head of the channel.

The channel from buoy No. 163 M curves southward for about 1 mile.

Pointe aux Trembles Curve lightbuoy No. 167 M, moored at the middle of Pointe aux Trembles curve, is a black spar gas buoy, exhibiting an intermittent white light.

Longue Point Traverse range lights.—The front lighthouse, on top of river bank, about $1\frac{1}{2}$ miles below Longue Point church, is a square white building surmounted by a white octagonal lantern, all 23 feet high, exhibiting, at 41 feet above high water, a fixed white light, visible in the range line 4 miles.

The rear lighthouse, situated 338 yards 348° from the front light, is a square white building, 45 feet high, which exhibits, at 65 feet above high water, a fixed white light, visible in the line of range 4 miles.

These lights in line astern, 348° , lead up through Longue Point traverse from about $\frac{1}{4}$ mile above lightbuoy No. 167 M to just above buoy No. 171 M, where the harbor limits begin.

Longue Point lightbuoy No. 174 M, moored 160° , 600 yards from Longue point, is a red spar gas buoy, exhibiting an intermittent white light.

Ile Ronde range lights.—The front lighthouse, situated on the northeastern side of ile Ronde, is a square white building, surmounted by an octagonal red lantern, all 32 feet high, on a concrete pier, and exhibits, at 43 feet above high water, a fixed white light, visible 5 miles.

The rear lighthouse, situated on the Guard pier, $1\frac{1}{7}$ miles, 202° , from the front light, is a square brown open framework tower, with white slatwork on upper part of side facing range, inclosed upper part and white octagonal lantern, with a red roof, all 64 feet high; it exhibits, at 97 feet above high water, a fixed white light, visible 6 miles.

The lights in line 202° lead up from the intersection of their range line near buoy No. 174 M, with Longue Point Traverse range, to the intersection of their range line with Bellerive Park range, near light buoy No. 181 M.

Pouillier à Gagnon lightbuoy No. 177 M, moored on the south-eastern side of the channel at 1.4 miles above Longue Point church, is a black spar buoy, which exhibits an intermittent white light.

Longueuil lightbuoy No. 181 M, moored at the northeastern end of Longueuil Shoal cutting, is a black spar gas buoy, which exhibits an intermittent white light.

Longueuil lightbuoy No. 191 M, moored to the westward of Longueuil shoal, between Nos. 181 M and 193 M, is a black spar, exhibiting an intermittent white light.

The channel, after rounding lightbuoy No. 174 M, leads directly toward lightbuoy No. 181 M; thence past lightbuoy No. 191 M, to 193 M; thence to lightbuoy No. 195 M, and thence to the wharves.

Lightbuoy No. 193 M is a black spar moored about $\frac{2}{3}$ mile below Ile Ronde, exhibiting an intermittent white light.

Lightbuoy No. 194 M, moored off Dezery street, opposite lightbuoy No. 193 M, is a red spar buoy, exhibiting an intermittent red light.

Bellerive Park leading lights.—Two fixed red electric arc lights are exhibited from a pole on the wharf and from a pole at 218° , 193 yards from the first; they are visible 2 miles on the range line. These lights in line lead up the middle of the ship channel from lightbuoy No. 181 M to the turn below lightbuoy No. 195 M.

St. Peter's church, Montreal, is situated 218° nearly $\frac{3}{4}$ mile from the front range light pole.

Ile Ronde lightbuoy No. 195 M, moored 400 yards northward of Ile Ronde, is a black spar gas buoy, which exhibits an intermittent white light.

Ile Ronde lightbuoy No. 196 M, moored off Frontenac street, Montreal, opposite lightbuoy No. 195 M, is a red spar, exhibiting an intermittent red light.

Hochelaga range lights.—Lamps attached to the day beacon on Hochelaga wharf, and to the day beacon on shore at 12° , 337 yards from it, both situated near Laurier pier, exhibit, at 27 and 40 feet above high river, two fixed red electric arc lights, visible 3 miles on the range line.

These lights in line astern, 12° , lead up through the dredged channel at St. Mary rapid from the turn at lightbuoy No. 195 M, into Montreal harbor, and about midway between the eastern end of Jacques Cartier pier and the northern end of the guard pier.

Directions from lightbuoy No. 89 M to Montreal.—From lightbuoy No. 89 M (see p. 538) steer 217° on Ile Delorier range ahead or Ile Bouchard range astern to lightbuoy No. 117 M. From this buoy the channel makes two curves to lightbuoy No. 124 M, and

there are no ranges, therefore the seaman must be guided by the buoys. From lightbuoy No. 117 M steer to leave buoy No. 122 M on the starboard hand, and from that buoy steer 189° for nearly $\frac{1}{4}$ mile or until the light on ile Delorier bears 350° , when the ship should be nearly abreast lightbuoy No. 124 M and nearly on Ile Ste. Thérèse lower range. Get on this range at once and steer on it 217° nearly up to lightbuoy No. 129 M, at the lower end of Varennes curve.

About 300 yards below lightbuoy No. 129 M leave the range and take the curve. Make the turn very carefully, as there are shoals on either side. After leaving the range, steer a little to the westward, keeping lightbuoy No. 129 M well on port bow; give the buoy a good berth and swing to the southward, keeping lightbuoy No. 133 M on the port bow, but not too much so. As soon as possible after rounding lightbuoy No. 133 M, get on Ile à l'Aigle range and steer on it 183° until the single light on the southeastern side of ile Ste. Thérèse bears 225° .

Now steer 202° in mid-channel between ile Ste. Thérèse and ile aux Vaches on the northwest and ile à l'Aigle on the southeast. When the light on ile aux Vaches bears 267° , get on Ile aux Vaches Traverse range astern, and steer on it 214° through the traverse nearly to the intersection of Ile aux Vaches Traverse range and Ile Ste. Thérèse upper range. Take this last range astern and steer on it 205° to buoy No. 163 M. Leave the buoy on the port hand and steer around the bend, being guided by the buoys, until past lightbuoy No. 167 M.

Steer now so as to get on Longue Point Traverse range at about $\frac{1}{4}$ mile above lightbuoy No. 167 M, and then keep on the range astern, steering 168° through the traverse to buoy No. 171 M. From that buoy steer a little to the southward to give lightbuoy No. 174 M a berth of 150 yards, and then to get on Ile Ronde range as soon as possible after passing the buoy. Steer 202° on Ile Ronde range to lightbuoy No. 181 M, whence take Bellerive Park range, steering on it 218° to lightbuoy No. 193 M.

At this buoy leave the range and steer fairly between lightbuoys No. 195 M and No. 196 M, keeping on the course until Hochelaga range is nearly on astern. Bring the range on and steer on it 192° , going to wharf as desired, and guarding against shoal off the Guard pier.

In deep draft ships keep on Bellerive Park range until lightbuoy No. 194 M, and two beacons, one on Laurier pier and one on Sutherland pier, are nearly in line, bearing 20° . Take this range astern and steer on it until lightbuoy No. 196 M is nearly in line with two beacons on shore bearing 8° ; take this last range and proceed to wharf as desired.

Montreal harbor is that portion of the St. Lawrence river which extends south-southwestward from Longue point for about 6 miles to about $\frac{3}{4}$ mile below Victoria bridge. It is the end of the deep draft navigation of the river, and it is capable of sheltering a large number of vessels.

Shoal water extends nearly all the way across the river from the eastern shore, abreast the city, leaving a deep water harbor and channel only a little more than $\frac{1}{4}$ mile wide in its widest part.

The Victoria bridge, on which the Grand Trunk railroad and two roadways cross the river, is a steel truss bridge about 7,000 feet long, and has 24 spans of 254 feet each, with one of 348 feet over the steamboat channel.

The Canadian Pacific railroad crosses the river at the foot of lake St. Louis, about 6 miles above Montreal.

Wharves.—Along the river bank at Montreal, for about $4\frac{1}{2}$ miles, there is a line of wharves, piers, and warehouses that is constantly being extended and improved. There is a large amount of additional wharfage at Maisonneuve, about $1\frac{1}{4}$ miles below ile Ronde. Three deep water piers, Jacques Cartier, King Edward, and Alexandra, extend into the harbor within and to the westward of the Guard pier, between Victoria pier and Windmill Point basin. This basin, close to the entrances to Lachine canal, is nearly $\frac{1}{2}$ mile in length and about 300 feet in width; there is a wharf on its eastern side and one also on its western side.

Repairs.—Large repairs to hull, machinery, and boilers can be made by the Laurie Engine company, Caledonian Ironworks, Gartle & Co., and the Allan Steamship company. This last company has a floating crane capable of lifting 25 to 30 tons.

Dry docks.—No. 1, **Government dock**, is situated in Lachine canal about $\frac{1}{2}$ mile from the entrance. It is 300 feet long, 45 feet broad, with a depth of 10 feet on the sill; before reaching it, two canal locks, each 270 feet long and 45 feet broad, with a depth of 18 feet on the sills, have to be passed.

No. 2, Cantin's dock, is also situated in the Lachine canal, about $1\frac{1}{3}$ miles from the entrance. It is 360 feet long, 45 feet broad, and has 10 feet water on the sill; before reaching it, a third lock of the same dimensions as the other two has to be passed.

Wet dock.—No. 1 basin, consisting of the old and the new basins, is situated between the first and the second pairs of locks of the Lachine canal. Its area is $3\frac{1}{2}$ acres, length 540 feet, and breadth 200 feet; it is entered by either of two locks 270 feet long, 45 feet broad, and with 18 feet water on the sills.

Supplies of all kinds can be obtained at Montreal.

Pilotage.—There are about 55 pilots in Montreal pilotage district, for and above Quebec harbor.

The pilotage dues for the removal of any vessel from one wharf to another, within the limits of the harbor, or from any of the wharves into Lachine canal; or out of the canal to any of the wharves, or from the foot of the current, or from Longueuil into the harbor, or from the harbor to the foot of the current, or to Longueuil, are, for each service, \$5. (For pilotage fees between Quebec and Montreal see page 509.)

Guard pier.—The guard or Mackay pier extends about 350°, 2,330 yards from near the Montreal end of Victoria bridge.

Ice.—The ice flowing down St. Lawrence river each spring from above Montreal is checked in its progress by the narrow passage between ile Ronde and Montreal. This check causes a considerable rise in the river level at Montreal, the water occasionally covering the wharves, and leaving great quantities of ice on those wharves not protected by the guard pier.

This movement of the ice is locally known as “the shove.” The shove of 1901 was a remarkable one. On April 14 of that year the ice was blocked or shoved bodily 100 feet upstream between the guard pier and Jacques Cartier pier, the water on the sill of Lachine lock reaching the height of 40 feet 2 inches. On the 17th the blockade gave way, and the water fell at the rate of 1 foot per hour for seven hours. From the head of the harbor to Victoria pier the wharves were left practically free of ice, but outside the area protected by the guard pier a quantity of ice approximating 78,730 cubic yards was left on the wharves.

Wintering.—Vessels can not winter in Montreal harbor, as they would be there exposed to the pressure of drift ice, except in the canals; but they are sent either to Sorel (see p. 531) or to Boucherville islands, which are situated off the eastern bank of the St. Lawrence between pointe aux Trembles and Longue point. These are the only places where large vessels are safe from the ice; but there are many places where small river craft may be secured.

Opening and closing of navigation.—The average date of the first arrival from sea is April 28, and that of the last departure for sea November 24. For ten years from 1893–1902 the dates of the first arrival have varied between April 17 and May 3, and those of the last departure from November 23 to December 4.

NOTE.—Although the St. Lawrence between Montreal and Quebec is well marked by range lights and buoys, it is not expected that the large trans-Atlantic steamers will leave Montreal during the night; their time for sailing is usually fixed in advance. Vessels of light draft, however, can leave at any time when they are ready in

clear weather. Inward-bound vessels can proceed to Montreal in ordinary weather.

Time signal.—A time ball is hoisted to the masthead at the tower of the harbor commissioner's building at about 11h. 55m. a. m., and dropped (by electricity from McGill University observatory) at noon Eastern Standard time, or mean time of the 75th meridian of West longitude, corresponding to 5h. 0m. 0sec. Greenwich mean time.

The signal is made daily, except on Sundays, during the season of navigation, and it may be depended on to less than $\frac{1}{2}$ second.

Should the ball for any reason fail to drop at noon, it will, if possible, be dropped at 1h. 0m. 0s. p. m. Eastern Standard time.

Hospital.—At Montreal, sick seamen are sent either to the general hospital or to Nôtre Dame hospital.

Montreal, the chief city and commercial capital of Canada, the principal port of entry, and the center of the railway systems, is situated on the eastern side of Montreal island, which is formed by the junction of St. Lawrence and Ottawa rivers. The city stands on a series of natural terraces at the foot of mount Royal, which rises to the height of 760 feet at about $1\frac{3}{4}$ miles from the St. Lawrence, and it is divided into lower and upper towns, the former being the trading quarter and the latter the residential. The city has two cathedrals, many churches, three large hospitals, McGill university, a branch of Laval university, and several colleges. The majority of the inhabitants are of French origin and are Roman Catholics. The city was founded in 1642 and taken from the French in 1760. Its population was 267,730 in 1901.

Communication.—Montreal is in communication by rail with all parts of Canada and the United States by means of the Grand Trunk, the Canadian Pacific, the New York Central and Hudson River, and the Intercolonial roads.

The following steamship lines run to Europe, etc.: Allan line, weekly to Liverpool and Glasgow; fortnightly to London and to Cherbourg or Havre. Canada-South African line, monthly to Capetown and other South African ports. Canadian Ocean and Inland line, fortnightly to Rotterdam. Canadian Pacific Atlantic lines, weekly to Liverpool, Bristol, and Antwerp; every 10 days to London. Dominion line, weekly to Liverpool; fortnightly to Bristol. Donaldson line, weekly to Glasgow. Hamburg-American line, every 10 days to Hamburg. Hansa-St. Lawrence line, fortnightly to Antwerp. Head line, weekly to Belfast and Dublin. Leyland line, fortnightly to Antwerp. Lord line, monthly to Cardiff. Manchester line, weekly to Manchester. Thomson line, weekly to London; fortnightly to Leith; monthly to Aberdeen.

During the winter nearly all of these lines transfer to Portland, Me., or to St. John or Halifax, and cut down the number of sailings. The Allan line stops its London and Cherbourg service entirely. The Hamburg-American and Hansa-St. Lawrence lines stop entirely; so does the Lord line. The Thomson line stops its Leith and Aberdeen service.

Telegraph.—The city is connected with all parts of Canada and the United States by telegraph.

Position.—The transit pier of the observatory of McGill university is in latitude $45^{\circ} 30' 22''$ N.; longitude $73^{\circ} 34' 40''$ W.

Climate.—The climate of Montreal is somewhat severe in winter, the mean temperature for the coldest winter month, January, being 13.3° F.; but the thermometer often being 10° to 15° below 0° .

The summers are sometimes hot, the highest mean temperature being 69.5° F. in July, but the thermometer sometimes reaches 90° .

Fogs are not frequent.

Gales are apt to blow in November, December, January, February, and March, particularly in the last two.

Trade.—The principal industries are manufactories of woolen and cotton goods, rubber, ropes, boots and shoes, clothing, tobacco, and works connected with the railway. There are also iron foundries, sugar refineries, sawmills, etc.

The principal exports are lumber, grain, flour, meal, eggs, cheese, butter, apples, cattle, sheep, and horses, and the principal imports are coal, cement, and iron.

The United States is represented by a consul-general and by a vice and deputy consul-general.

CHAPTER XIV.

ST. LAWRENCE RIVER ABOVE MONTREAL—GENERAL DESCRIPTION OF THE CANAL, RIVER, AND LAKE NAVIGATION.

NOTE.—In this chapter only a very general description of the navigation is given. For detailed information and sailing directions the seaman is referred to Hydrographic Office publications, Nos. 108 D, 108 C, 108 B, and 108 A; all of the Great Lakes.

The river St. Lawrence is closed to navigation immediately above Montreal by Lachine rapids, the first of a series of rapids which obstruct the river.

These impediments are so far avoided by canals, constructed by the Dominion government and by the United States and the State governments, that vessels 255 feet in length and drawing 14 feet of water, can navigate between Montreal and lake Erie; and vessels of 20 feet draft between lakes Erie, Huron, and Superior by passing through the American St. Marys Falls canal, or of 17 feet 6 inches draft by passing through the Canadian Sault St. Marie canal.

Canal and lake vessels.—The canal type of steam vessel is about 255 feet in length over all, 42 feet beam, and 26 feet molded depth; built of steel. These vessels carry about 2,000 to 3,000 tons on a draft of 14 feet water, and they are available both for the lakes and for crossing the Atlantic if required.

Many of the vessels employed in the Great Lakes are steel freight steamers of 450 to 500 feet in length, and of 7,000 to 8,000 net tons capacity, with quadruple expansion engines of 1,800 to 3,000 horse power, and generally with water tube boilers.

Lighting.—The approaches to the canals and the channels through the intermediate river reaches are well defined and are lighted with lights and gas buoys, admitting of safe navigation, if the vessel is in the hands of competent pilots, both by day and night. There are also numerous lights on the shores of the Great Lakes. (See publications named above.)

Opening and closing of navigation.—Lachine and Soulanges canals open about May 1 and close about December 1. Lake Ontario never freezes except near the shore and navigation is rarely interrupted. Lakes Erie, Huron, Michigan, and Superior are usually

closed to navigation by ice from about the middle of December to the middle of April.

All Canadian canals are closed on Sundays from 6 a. m. to 9 a. m.

Lake navigation.—The principal difficulties of lake navigation are fog and snow. There are no tides or tidal streams and the currents are weak.

Montreal to lake Superior.—The through route from Montreal to the head of lake Superior has a minimum depth of 14 feet water, and is as follows:

	Miles.
Lachine canal -----	8½
Lake St. Louis and river St. Lawrence -----	16
Soulanges canal (or Beauharnois canal, only 9 feet deep, 11¼ miles) -----	14
Lake St. Francis and river St. Lawrence -----	33
Cornwall canal -----	11
River St. Lawrence -----	5
Farrans Point canal -----	1
River St. Lawrence -----	10
Rapide Plat canal -----	3½
River St. Lawrence -----	4
Galops canal -----	7¼
River St. Lawrence and lake Ontario -----	236
Welland canal -----	26¾
Lake Erie, Detroit river, lake St. Clair, lake Huron, etc.---	580
Sault Ste. Marie canal, or St. Mary Falls canal -----	1¼
Lake Superior to Port Arthur -----	266
<hr/>	
Total distance -----	1, 223½
To Duluth -----	1, 357
To Chicago -----	1, 286

Lachine canal extends from Montreal harbor to the town of Lachine, overcoming St. Louis rapids; it is 8½ miles long; has 5 locks, each 270 feet long and 45 feet wide, with a total rise or lockage of 45 feet. The depth of water on the sills is 14 feet to 18 feet, and the average width of the canal is 150 feet. The canal consists of one channel, with two distinct systems of locks, the new and the old; the latter are still available and have a depth of 9 feet on the sills. There are two lock entrances at each end.

Lake St. Louis and river St. Lawrence.—From the head of Lachine canal to the foot of Soulanges canal the distance, by lake St. Louis and river St. Lawrence, is 16 miles, and the least water in the channel is 28 feet.

Soulanges canal, on the northern bank of the river, extends from Cascade point to Coteau landing, overcoming Cascade rapids, Cedar rapids, and Coteau rapids; it is 14 miles long; has 4 lift locks and one guard lock, each 280 feet long and 45 feet wide, with a total rise or lockage of 84 feet; the depth of water on the sills is 15 feet; the

breadth of the canal at the bottom is 100 feet and at the water surface 164 feet. It is lighted by 219 electric arc lights of 2,000 candlepower each.

Beauharnois canal, on the southern bank of the river, is $11\frac{1}{4}$ miles long from Melocheville to Valleyfield, and overcomes the same rapids as the Soulanges canal. It is 80 feet wide at the bottom and 120 feet at the water surface; it has 9 locks, each 200 feet long and 45 feet wide, with a depth of 9 feet water on the sills, and a total rise or lockage of 82 feet.

Lake St. Francis and river St. Lawrence.—From the head of Soulanges canal to the foot of Cornwall canal the distance, by lake St. Francis and river St. Lawrence, is 33 miles, and it is navigable for vessels drawing up to 14 feet.

Cornwall canal, Ontario, extends past Long Sault rapids from the town of Cornwall to Dickenson's landing; it is 11 miles long; has 6 locks, each 270 feet long and 45 feet wide, with a total rise or lockage of 48 feet; the depth of water on the sills is 14 feet; the breadth of the canal at the bottom is 100 feet and at the water surface 164 feet. The old lift locks, 200 feet long and 45 feet wide, with 9 feet water on their sills, are also available.

River St. Lawrence.—From the head of Cornwall canal to the foot of Farrans Point canal the distance on St. Lawrence river is 5 miles.

Farrans Point canal, Ontario, overcomes Farrans Point rapid; descending vessels run the rapid with ease and safety. The canal is 1 mile long; and has 1 lock 800 feet long and 45 feet wide (this lock enables the full tow to be passed at one lockage); there is also an old lock 200 feet long and 45 feet wide; the total rise or lockage is $3\frac{1}{2}$ feet; the depth of water on the sills of the new lock is 14 feet, and on those of the old lock 9 feet; the breadth of the canal is 90 feet at the bottom and 154 feet at the water surface.

River St. Lawrence.—From the head of Farrans Point canal there is a navigable stretch of $10\frac{1}{2}$ miles on the St. Lawrence to the foot of Rapide Plat canal.

Rapide Plat or Morrisburg canal, Ontario, extends from Morrisburg, just below Rapide Plat, to Flaggs bay, enabling vessels ascending the river to pass the rapid at Rapide Plat; descending vessels run the rapid safely. This canal is $3\frac{2}{3}$ miles long; it has 2 locks, each 270 feet long and 45 feet wide, with a total rise or lockage of $11\frac{1}{2}$ feet; the depth of water on the sills is 14 feet; the breadth of the canal is 80 feet at the bottom and 152 feet at the water surface.

River St. Lawrence.—From the head of Rapide Plat canal to Iroquois, at the foot of Galops canal, the distance on the St. Lawrence is $4\frac{1}{2}$ miles.

Galops canal enables vessels to overcome the rapids at point aux Iroquois, point Cardinal, and Galops; it is $7\frac{1}{3}$ miles long, and has 3 locks, of which 2 are 270 feet long and 45 feet wide, and one 800 feet long and 45 feet wide, with a total rise or lockage of $15\frac{1}{2}$ feet; the depth of water on sills is 14 feet; the breadth of the canal is 80 feet at the bottom and 144 feet at the water surface.

Farrans Point, Rapide Plat, and Galops canals are collectively known as the Williamsburg canals.

St. Lawrence river from the head of Galops canal to Kingston, Ontario, and Cape Vincent, New York, at the entrance to lake Ontario, a distance of about 70 miles, is naturally navigable, and the water is deep.

Lake Ontario is the eastern and smallest of the great lakes; it is 193 miles long and 54 miles broad at its widest part; its greatest depth is 738 feet, and its surface is 247 feet above mean sea level and 326 feet below lake Erie. Its basin drains 29,760 square miles, including the lake surface of 7,250 square miles. Its principal tributaries are the Niagara, Genesee, and Oswego rivers on its southern shore, and the Trent on its northern shore.

The principal Canadian ports on the lake are Kingston, Toronto, and Hamilton. Oswego is the principal United States port.

Murray canal, extending through Murray isthmus, situated about 57 miles westward of Kingston, gives connection between the headwaters of bay of Quinte and lake Ontario, enabling vessels to avoid open lake navigation. The length of the canal is $5\frac{1}{6}$ miles; the breadth at the water surface is 120 feet and at the bottom 80 feet, and the depth 11 feet; there are no locks.

Welland canal connects Port Dalhousie, situated about 32 miles from the western end of lake Ontario, with Port Colborne, near the eastern end of lake Erie, avoiding Niagara river and falls. It has two entrances at Port Dalhousie, one for the old and the other for the new canals, as there are two lines from Port Dalhousie to Allanburgh, a distance of $11\frac{3}{4}$ miles, whence to Port Colborne there is only one channel. The whole new canal is $26\frac{3}{4}$ miles long; it has 26 locks, each 270 feet long and 45 feet wide, with a depth of 14 feet over the sills, and a total rise or lockage of $326\frac{3}{4}$ feet.

Welland canal has two branches, one, Welland river, from Port Robinson (2 miles southward of Allanburgh) to Chippewa, on Niagara river at 3 miles above the falls; the other, from near Welland town, by canal feeder, to Port Maitland on lake Erie, 17 miles westward from Port Colborne. The length of the Chippewa branch is $8\frac{1}{4}$ miles, the dimensions of the smaller of the two locks, 150 feet by $26\frac{1}{2}$ feet, and depth of water nearly 9 feet. The length of the Port Maitland branch is about 18 miles, with one lock 185 feet long, 45 feet broad, and 11 feet water over the sill.

Works are in progress at Port Colborne to enable vessels drawing 20 feet water to enter the head of the canal and transfer their cargoes through elevators into vessels suitable for navigating the canals to Montreal.

Navigation westward.—From the head of Welland canal there is navigation through lake Erie, Detroit river, lake St. Clair, St. Clair river, lake Huron, and St. Mary river to the Sault canal, a distance of about 580 miles.

Lake Erie, the southernmost of the great lakes, is nearly elliptical in shape, its greatest length, east and west, being 260 miles, and its greatest breadth, north and south, 58 miles. Its area is about 10,000 square miles; its surface is 573 feet above mean sea level, and 326 feet above that of lake Ontario, this great descent being taken up by Niagara river and falls. Its shores are generally bold and high. The peculiar features of the lake are its shallowness, the greatest recorded depth being 210 feet, and the depth, excepting eastward and southeastward of Long point, rarely exceeding 102 feet, and its clayey shores. There is an immense trade on the lake.

Erie canal, in United States territory, connects Buffalo on lake Erie with Troy and Albany on the Hudson river, and with lake Ontario at Oswego. The canal from Buffalo to Albany is 351 miles long and it has a depth of 7 feet; it is 70 feet wide at the surface and 52½ feet at the bottom, and it has 72 locks, each 110 feet long and 18 feet wide. It accommodates vessels up to 240 tons.

Ports.—There are few harbors on the Canadian shores of lake Erie, but on the United States side there are ten great ports dredged to accommodate the largest lake steamers.

Detroit river, St. Clair lake and river, connecting lakes Erie and Huron, are practically one river enlarged in the middle by lake St. Clair, which is about 25 miles across and shallow. Navigation is afforded to vessels drawing 20 feet, to which depth channels have been dredged through the shallows. The city of Detroit is near the head of Detroit river on the United States side, and it has deep water alongside its numerous wharves. The town of Windsor is on the Canadian side, and it is the terminus of several railways.

The Canadian town of Sarnia and the United States town of Port Huron, Mich., are at the mouth of St. Clair river, and they are connected by the Grand Trunk railway, which passes through a tunnel under the river.

Lake Huron is 221 miles long from St. Clair river to Spectacle reef, and it is 98 miles across on the parallel of 45° N. latitude. It has a greatest depth of 750 feet, and is 581 feet above the sea. The northern and northeastern shores of the lake are sandstone and limestone, and where metamorphic rocks are found the surface is broken

and hilly, rising to elevations of 600 feet or more above the lake, while the southern shores are comparatively flat and of great fertility.

Georgian bay lies in the northeastern part of lake Huron. Depôt harbor, on the northeastern shore of the bay, is a natural harbor, about 660 yards wide, deep enough to accommodate the largest vessels employed on the lakes, and perfectly safe in all winds. In connection with the harbor the Canada Atlantic Transit company operates between Chicago, Milwaukee, Duluth, and Depôt harbor a number of steamers of 4,000 to 7,500 tons. These vessels make return trips every week, and each has a capacity of 130,000 to 275,000 bushels of corn. Large quantities of flour, pork, starch, etc., are also transported for British and continental ports. The wharves and other facilities of Depôt harbor were built by the Canada Atlantic railway, of which it is the western terminus.

Owen sound, on the southwestern shore of the bay, is the center of an extensive agricultural district; it is the terminus of branches of the Canadian Pacific and Grand Trunk railways. Several lines of steamers run to and from Owen Sound. Meaford, Collingwood, Penetanguishene, and Midland are shipping places in the southeastern part of the bay, connected with branches of the Grand Trunk railway.

Algoma Mills is situated on the northern shore of North channel of lake Huron; it is a station on the Canadian Pacific railway. An extensive lumbering business is done here, and some 75,000 tons of coal are annually imported.

The most important port on the United States side is Bay City, at the head of Saginaw bay, in Michigan.

Mackinac strait (pronounced Mackinaw) leads from the northwestern part of lake Huron into lake Michigan; it is $3\frac{1}{2}$ miles wide in its narrowest part. The water in the strait is generally deep, and the shoals near the usual routes are marked by lighthouses, lightvessels, or buoys. Railway ferry ice-breaking steamers ply across the strait.

Lake Michigan is the second largest fresh water lake in the world; its length in a north and south direction is 320 miles, with an average width of 65 miles; its area is 22,400 square miles. Its surface is 581 feet above the mean level of the sea, and it has a greatest depth of 858 feet. The lake, which is wholly within the United States, is connected by canal with Illinois river, and so with the gulf of Mexico. The shores of the lake are generally low and sandy, and the land rises gradually from them. The land in the vicinity of the lake is very fine for agricultural purposes, and there is an enormous trade in all grains, fruits, live stock, and lumber, with their products.

Chicago, Ill., the principal port in the lake, is in its southwestern corner. The number of vessels arriving and departing from the port is greater than that of any other port in the United States, though the tonnage is less than that of New York. The number of vessels making direct passages to Europe is increasing. Many railways enter the city, and afford facilities for transporting goods to all parts of the country. The grain elevators are noticeable, vessels being loaded and unloaded by machinery. The principal trade is in live stock, pork and beef packing, and other products of the farm and dairy, flour, grain, seed, iron and steel manufactures, leather, shoes, chemicals, wine, brewing and distilling, cigars, tobacco, etc.

Milwaukee is in Wisconsin and is, next to Chicago, the largest city on the lake, and is situated on the shore of Milwaukee bay on the western side of the lake. It has a large commerce, and vessels now call there direct from Europe.

St. Marys river is the connecting link between lakes Huron and Superior, and it is $82\frac{1}{2}$ miles in length from Detour point on lake Huron to Iroquois point on lake Superior. The only places of any importance are the Canadian and United States towns of Sault Ste. Marie, situated on either side of the river near St. Marys rapids (Sault is pronounced Soo). At these rapids the river descends 22 feet in $\frac{3}{4}$ mile. Canals are constructed to avoid St. Marys rapids.

Sault Ste. Marie canal, the Canadian canal, is cut through red sandstone rock on the northern side of the rapids; it is crossed by a swing bridge of the Canadian Pacific railway. The canal is 5,967 feet in length, and it has one lock, 900 feet long and 60 feet wide, having a depth of 20 feet 3 inches on the sills at the lowest known level, and a total rise or lockage of 18 feet; the breadth of the canal at the bottom is 141 feet 8 inches, and at the surface 150 feet.

The present depth of the lower approaches to this canal is limited to the accommodation of vessels of 17 feet 6 inches draft, but they are being deepened to 21 feet 6 inches, which will enable the depth of the lock to be utilized to its full extent.

St. Marys Falls canal, the United States canal, on the southern side of St. Marys rapids, is 7,000 feet in length, with a least width of 108 feet at a movable dam at its upper end. It has one lock, 800 feet long and 100 feet wide, with 21 feet water on the sills, and a rise or lockage of 18 feet.

Both canals are lighted by electric arc lights; and they are free from toll.

Lake Superior is the largest lake in the world; its greatest length is 412 miles and breadth 167 miles; its area is 31,200 square miles; its greatest depth about 1,008 feet. The surface of the lake is 602 feet above the mean level of the sea. The water is cold, its temperature

not rising much above freezing point even in midsummer, and it is very clear. Mirage is frequent and deceptive. Nipigon, Black, and Thunder bays, on the northern side of the lake, contain good anchorages.

From the Sault the distance through lake Superior to Port Arthur is 266 miles, and to Duluth 400 miles.

Port Arthur, in Thunder bay, is an important station of the Canadian Pacific railway. Duluth is a port of the United States in the western end of the lake, and it is connected with the railway system of the United States. The city of Superior is $5\frac{3}{4}$ miles southeastward of it.

Surveys.—The hydrographic survey of the Canadian shores of the Great lakes is in progress; a vessel has been employed surveying the shores of Georgian bay, lakes Erie and Huron since 1883, but no survey has been made of the shores of lakes Ontario and Superior since that of Lieutenant Bayfield, R. N., in 1823–1825. The United States shores of the Great lakes were surveyed from 1855–1876, and changes are reported as they occur.

Charts of the Canadian shores of the Great lakes are published by the British Admiralty. Georgian bay and North Channel Pilot, general sailing directions for Georgian bay and North channel of lake Huron, with their many excellent harbors, is published by the Canadian government.

Charts of the lakes and United States shores are published by the United States Corps of Engineers.

The sailing directions are published by the United States Hydrographic Office, under the numbers given in the note at the head of the chapter.

Dry docks.—The principal dry docks on the Canadian shores of the Great lakes are at Kingston and Toronto in lake Ontario, Collingwood and Owen sound in Georgian bay; and on the United States shores of the lakes at Buffalo, Cleveland, Levee, and Toledo in lake Erie, Detroit on the river of that name, Port Huron on St. Clair river, Bay City on lake Huron, Chicago, Manitowoc, and Milwaukee on lake Michigan, and West Superior on lake Superior.

Repairs to hulls, boilers, and machinery can be executed at the above places.

For dimensions of the dry docks, floating docks, and patent slips, as well as particulars as to repairs, see Dock book of the British Admiralty, and Docking facilities of the world, published by U. S. Naval Intelligence Office.

Montreal to Ottawa and Kingston.—This route extends from Montreal harbor to the port of Kingston, passing through Lachine canal (see p. 548), the navigable sections of the lower river Ottawa,

and Ottawa canals, to the city of Ottawa, thence by Rideau river and canal to Kingston, on lake Ontario, a total distance of 246 miles.

The sections are, Lachine canal, $8\frac{1}{2}$ miles; Lachine canal to Ste. Anne's lock, 15 miles; Ste. Anne's lock, $\frac{1}{8}$ mile; Ste. Anne's lock to Carillon canal, 27 miles; Carillon canal, $\frac{3}{4}$ mile; Carillon canal to Grenville canal, $6\frac{1}{4}$ miles; Grenville canal, $\frac{3}{4}$ mile; Grenville canal to Ottawa, 56 miles; Ottawa to Kingston by Rideau navigation, $126\frac{1}{4}$ miles. The navigable depth is 9 feet from Montreal to Ottawa, with locks 200 feet long and 45 feet wide; and $4\frac{1}{2}$ feet from Ottawa to Kingston, with locks 134 feet long and 33 feet wide.

Trent canal.—The term "Trent canal" is applied to a series of water stretches, which do not form a connected system of navigation and are at present efficient only for local use, but, by works in progress and contemplation, it will become a through route between lake Ontario and Huron. The series is composed of a chain of lakes and rivers, extending from Trenton, on the bay of Quinte, through Trent river, Rice lake, Otonabee river, lakes Clear, Stony, Lovesick, Deer, Buckhorn, Chemung, Pigeon, Sturgeon, and Cameron to lake Balsam, the summit water, 165 miles from Trenton; thence by canal and Talbot river to lake Simcoe, and Severn river to Georgian bay, the total distance being about 200 miles, of which only about 15 to 20 miles will be actual canal. All sections of this work have been contracted for and the system will probably be in operation in 1910.

Montreal, Ottawa, and Georgian Bay canal.—Surveys have been made for opening a 14-foot navigation from Montreal to Georgian bay, via Ottawa river, lake Nipissing, and French river, with a depth of 16 feet in the open reaches, and locks 280 feet long and 45 feet wide. Estimates have also been prepared for a 20-foot navigation by the same route. Some sections of the work are under way.

Meteorological table compiled from 7 to 15 years' observations.

[Place.—BELLE ISLE. Obs. Δ. Latitude 51° 53' N., longitude 55° 22' W.]

Month.	Barometer, reduced to 32° and sea level.		Temperature.			Relative humidity.	Clouds, 0 to 10, mean amount.	Rain.		Wind.								Number of days gales.	Number of days fogs.	Barometer.	Tempera- ture.	Maximum wind force, Beaufort scale.			
	Mean height.	Extreme range.	Mean.	Mean daily range.	Mean.			Total fall.	Number of days.	Force, Beau- fort scale.	Number of days from—														
											N.	NE.	E.	SE.	S.	SW.	W.						NW.	Calm.	
January.....	Ins. 29.80	Ins. 2.07	13.2	10.0	14.7	° 4.7	Ins. 0.48	2	5	6	3	2	3	6	7	0	20	5	Ins. 30.57	Ins. 28.50	° 40	° 27	° 67	11	
February.....	29.78	1.97	12.7	8.0	20.1	12.1	.11	2	4	6	3	3	4	4	3	0	15	6	30.57	28.60	39	—26	65	11	
March.....	29.82	1.98	19.4	9.6	25.5	15.9	2.46	5	5	4	3	3	7	7	4	0	19	9	30.54	28.56	40	—18	58	11	
April.....	29.95	1.68	27.7	9.1	32.9	23.8	1.91	6	4	6	2	1	1	6	4	0	13	6	30.59	28.91	56	—10	66	11	
May.....	29.97	1.57	34.9	8.8	40.1	31.3	2.91	9	4	4	3	5	2	7	4	0	13	10	30.52	28.95	59	12	47	11	
June.....	29.97	1.48	43.4	9.7	48.8	39.1	4.40	12	3	4	5	5	1	7	1	0	10	13	30.59	29.11	60	22	47	11	
July.....	29.95	1.33	50.3	10.8	56.0	45.2	7.06	14	3	4	3	5	2	3	10	0	8	19	30.57	23.24	70	32	38	9	
August.....	29.98	1.32	52.2	10.7	58.4	47.7	5.26	11	3	4	3	4	3	8	2	0	7	15	30.50	29.18	71	31	40	9	
September.....	29.91	1.78	46.2	10.0	51.8	41.8	5.72	14	4	4	2	2	4	4	10	0	11	12	30.56	28.78	68	29	39	11	
October.....	29.91	1.81	37.9	7.6	41.8	34.2	5.26	9	4	4	2	3	1	4	8	0	15	13	30.58	28.77	57	17	40	10	
November.....	29.85	1.68	27.1	8.2	31.2	23.0	1.70	4	4	4	2	2	2	3	6	0	17	10	30.56	28.88	48	—6	54	10	
December.....	29.79	1.58	15.5	8.6	21.8	13.2	1.36	4	4	5	3	2	1	3	7	0	16	3	30.53	28.95	40	—21	61	10	
Means and to- tals.....	29.89	2.09	31.7	9.2	36.9	27.7	38.63	92	4	55	44	35	39	22	86	50	0	164	121	30.59	28.50	71	—27	98	11
Years' obser- vations.....	8		15	8	8	7	15	7	8	8	8	8	8	15	8	8	8	8	15	8	15	8	15	8	8

Meteorological table compiled from 7 to 15 years' observations.

[Place.—HEATH POINT, ANTICOSTI. Obs. Δ. Latitude 49° 05' N., longitude 61° 42' W.]

Month.	Barometer, reduced to 32° and sea level.		Temperature.				Relative humidity.	Clouds, 0 to 10, mean amount.	Rain.		Average hourly ve- locity.	Wind.								Number of days gales.	Number of days fogs.	Temperature absolute range.	Remarks.		
	Mean height.	Ex treme range.	Mean.		Mean daily range.	Absolute.			Total fall.	Number of days.		Number of days from—													
			Max.	Min.		N.						NE.	E.	SE.	S.	SW.	W.	NW.	Calm.						
January.....	12.7	°	°	42.0	°	.....	Ins.	1	.....	7	1	2	1	4	1	5	10	0	2	0	67.0	°	
February.....	13.0	.....	°	38.0	-25.0	.....	.....	2	.....	9	2	4	1	2	1	4	5	0	1	0	(3.0		
March.....	20.5	.....	°	43.0	-20.0	.....	.....	3	.....	7	3	4	1	3	1	7	5	0	3	1	63.0		
April.....	28.7	.....	°	55.5	0.0	.....	.....	3	.....	7	3	5	1	2	2	8	2	0	1	3	55.5		
May.....	37.0	.....	°	56.0	15.0	.....	.....	6	.....	7	2	3	1	5	2	10	1	0	2	6	41.0		
June.....	48.4	.....	°	79.0	32.0	.....	.....	5	.....	7	2	3	2	4	2	9	0	1	2	4	47.0		
July.....	55.4	.....	°	75.0	40.0	.....	.....	5	.....	4	1	3	0	5	3	15	0	0	0	8	35.0		
August.....	56.4	.....	°	76.0	39.0	.....	.....	5	.....	4	0	3	1	5	3	14	1	0	2	6	37.0		
September.....	50.5	.....	°	77.0	30.0	.....	.....	5	.....	6	1	2	0	4	3	12	2	0	3	4	47.0		
October.....	40.2	.....	°	59.0	12.0	.....	.....	5	.....	6	1	3	1	4	2	10	4	0	4	2	47.0		
November.....	28.7	.....	°	55.0	-3.0	.....	.....	5	.....	6	2	3	1	4	3	5	6	0	2	3	58.0		
December.....	18.4	.....	°	46.0	-15.0	.....	.....	2	.....	7	1	3	0	3	2	6	9	0	1	0	61.0		
Means and totals.....	34.2	.....	°	79.0	-25.0	.....	.....	47	.....	77	19	38	10	45	25	105	45	1	23	37	104.0		
Years' observations.....	15	.....	15		.....	.....	15	.....	.....	7								15		15			

Meteorological table compiled from 8 to 33 years' observations.

[Place.—CHARLOTTETOWN. Obs. Δ Latitude 46° 14' N., longitude 63° 07' W.]

Month.	Barometer, reduced to 32° and sea level.		Temperature.				Relative humidity.	Clouds, 0 to 10, mean amount.	Rain.		Wind.								Number of days gales.	Number of days fogs.	Barometer.		Temperature.		
	Mean height.	Extreme range.	Mean.	Mean.		Total fall.			Number of days.	Number of days from—								Max.			Min.	Range.	°		
				Mean daily range.	Max.					Min.	N.	NE.	E.	SE.	S.	SW.	W.							NW.	Calm.
January.....	Ins. 29.95	Ins. 2.26	° 16.9	° 16.3	° 25.5	° 9.2	86	6	0.78	5	1	2	3	2	2	6	3	Ins. 30.93	Ins. 28.67	° 51.7	° -26.7	78.4			
February.....	29.88	2.36	18.2	16.0	27.0	11.0	87	6	1.16	5	1	2	2	1	2	7	2	30.88	28.52	46.8	-16.8	63.6			
March.....	29.89	2.17	25.8	14.4	33.6	19.2	84	6	1.74	7	1	1	4	2	3	6	3	30.94	28.77	52.7	-14.2	66.9			
April.....	29.90	1.80	35.9	14.2	43.8	29.6	78	6	1.86	10	1	2	7	2	2	6	1	30.67	28.87	70.6	2.4	68.2			
May.....	29.94	1.48	47.2	16.9	56.2	39.3	75	6	2.92	16	1	3	5	2	2	5	0	30.59	29.11	79.4	25.8	53.6			
June.....	29.91	1.28	57.8	16.7	66.5	49.8	77	6	3.00	14	1	2	3	2	2	7	1	30.46	29.18	85.0	33.6	51.4			
July.....	29.91	1.28	64.5	15.5	72.6	57.1	79	6	3.71	15	1	2	2	1	4	6	0	30.50	29.22	87.6	43.2	44.4			
August.....	29.95	1.06	64.9	14.4	72.4	58.0	79	6	3.43	14	1	2	2	2	4	6	1	30.38	29.32	88.0	45.2	42.8			
September.....	30.01	1.62	57.8	14.4	64.9	50.5	78	6	3.09	13	1	2	2	1	3	5	1	30.48	28.86	85.2	34.1	51.1			
October.....	29.99	1.68	47.0	12.8	53.5	40.7	80	7	4.58	15	1	3	3	1	2	5	1	30.63	28.95	76.8	25.4	51.4			
November.....	29.94	1.96	35.4	11.6	41.8	30.2	83	7	2.65	12	1	3	3	1	1	4	3	30.78	28.82	62.8	3.2	59.6			
December.....	29.92	2.18	25.1	13.0	31.4	18.4	86	7	1.68	8	1	2	4	1	2	4	3	30.84	28.66	52.0	-17.9	69.9			
Means and totals.	29.93	2.42	41.4	14.7	49.1	34.4	81	6	30.60	134	1	26	41	18	22	31	57	51	52	67	88.0	-26.7	114.7		
Years' observations	26	14	33	15			13	20			14					8				14		21			

Meteorological table compiled from 8 to 36 years' observations.

[Place.—SYDNEY—CAPE BRETON ISLAND. Obs. Δ. Latitude 46° 09' N., longitude 60° 11' W.]

Month.	Barometer, reduced to 32° and sea level.		Temperature.				Relative humidity.	Clouds, 0 to 10, mean amount.	Rain.		Wind.								Number of days gales.	Number of days fogs.	Barometer.	Temperature.					
	Mean height.	Extreme range.	Mean.	Mean daily range.	Mean.				Total fall.	Number of days.	Force, Beaufort scale.	Number of days from—										Absolute.		Max.	Min.	Range.	
					Max.	Min.						N.	NE	E.	SE.	S.	SW.	W.				NW.	Calm.				Max.	Min.
January.....	Ins. 29.91	Ins. 2.35	20.9	16.6	29.3	12.7	87	7	1	1	2	1	1	6	4	9	6	2	1	30.92	Ins. 28.57	58.0	—25.0	83.0			
February.....	29.86	2.45	20.5	16.9	29.6	12.7	87	5	1	1	3	2	1	5	3	7	6	2	1	30.95	28.50	53.0	—24.0	77.0			
March.....	29.88	2.18	26.6	17.1	35.6	18.5	85	8	1	2	3	2	2	7	2	7	5	3	1	30.94	28.76	56.6	—24.2	80.8			
April.....	29.90	1.76	35.3	16.5	44.7	28.2	80	10	1	2	5	3	1	7	2	7	3	1	3	30.66	28.90	77.5	—0.2	77.7			
May.....	29.96	1.69	44.9	15.7	52.2	36.5	77	15	1	1	5	2	1	10	1	6	4	1	4	30.62	28.93	83.6	22.4	61.2			
June.....	29.93	1.30	54.3	15.3	61.1	45.8	77	14	1	1	4	2	2	11	1	5	3	1	2	30.50	29.20	91.5	28.4	63.1			
July.....	29.93	1.34	61.2	13.7	67.2	53.5	80	15	1	1	3	1	1	16	1	4	4	0	2	30.53	29.19	88.0	33.4	54.6			
August.....	29.96	1.26	63.2	17.7	72.5	54.8	82	14	1	1	1	1	2	14	2	3	4	0	2	30.41	29.15	90.0	38.2	51.8			
September.....	30.01	1.53	56.4	18.1	65.8	47.7	81	6	1	1	2	1	1	11	2	7	4	0	2	30.56	29.03	88.0	29.4	58.6			
October.....	29.98	1.77	46.8	15.5	54.6	39.1	82	7	1	1	3	1	1	11	2	7	5	2	2	30.66	28.89	81.3	23.5	57.8			
November.....	29.94	2.09	37.2	13.2	44.2	31.0	84	8	1	1	3	1	1	7	3	8	5	1	2	30.84	28.75	67.0	—7.0	74.0			
December.....	29.84	2.37	27.7	12.6	34.1	21.5	87	8	1	1	3	1	2	6	3	10	5	2	2	30.82	28.45	58.0	—14.0	72.0			
Means and totals.	29.93	2.50	41.3	15.7	49.2	33.5	82	7	1	14	38	18	16	8	111	26	80	54	15	30.95	28.45	91.5	—25.0	116.5			
Years' observations.....	29	17	36	15				16	17	8								17	24	17	24						

Meteorological table compiled from 8 to 29 years' observations.

[Place.—MONTREAL. Obs. A. Latitude 45° 30' N., longitude 73° 34' W.]

Month.	Barometer, reduced to 32° and sea level.		Temperature.			Rain.		Wind.								Barometer.		Temperature.		Maximum wind force, Beaufort scale.							
	Mean height.	Extreme range.	Mean.	Mean daily range.	Max.	Min.	Total fall.	Number of days.	Force, Beaufort scale.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.	Number of days gales.		Number of days fogs.						
																						Mean.		Absolute.		Range.	
January.....	Ins. 30.05	Ins. 2.06	° 13.3	° 16.7	° 22.2	° 5.5	Ins. 0.90	4	2	5	2	2	1	4	7	6	3	1	8	2							
February.....	30.00	2.21	16.3	14.9	24.0	9.1	0.90	4	3	4	2	1	1	4	7	6	3	0	11	1							
March.....	29.95	2.09	23.1	14.8	33.1	18.3	0.86	6	2	4	3	1	3	4	7	5	4	0	12	1							
April.....	29.95	1.45	40.7	17.2	50.0	32.8	1.59	11	2	5	6	1	3	3	7	3	2	0	6	1							
May.....	29.93	1.08	55.5	18.1	64.6	46.5	2.93	16	2	5	3	3	3	4	6	5	2	0	3	1							
June.....	29.90	1.39	64.9	16.9	73.1	56.2	3.16	16	2	3	2	2	2	4	7	6	4	0	3	0							
July.....	29.90	1.54	69.5	16.0	77.5	61.5	4.16	16	2	3	3	2	2	5	8	5	3	0	2	0							
August.....	29.95	0.87	67.7	15.6	75.7	60.1	3.14	14	2	5	1	2	1	6	7	7	2	0	0	0							
September.....	30.02	1.65	59.2	15.4	67.1	51.7	3.34	13	2	4	1	2	2	5	7	6	3	0	2	1							
October.....	30.02	1.72	45.6	14.9	52.7	37.8	3.38	16	2	5	2	1	2	6	7	5	2	1	3	2							
November.....	30.01	2.05	31.8	12.9	38.1	25.2	2.41	12	2	3	3	2	3	4	7	5	3	0	7	2							
December.....	30.03	2.16	18.7	13.9	26.4	12.5	1.34	6	2	4	2	2	2	5	8	5	2	1	7	2							
Means and totals.....	29.98	2.33	42.4	15.6	50.4	34.8	28.16	134	2	50	30	21	25	54	85	64	33	3	64	13							
Years' observations	29	16	36	15	16	16	24	16	8	15	16	24	8	24	8	24	8	8	15	16							

INDEX.

A.	Page.		Page.
Abattis, l'.....	499	Ammonite point and reef.....	386
Abercrombie point.....	150	Anchor island, reef, Bonne Espérance	
Aggermore rock.....	169	bay.....	344
Agwanus river.....	379	— — Saints channel.....	384
Aid islet.....	360	Andromache rocks.....	88
Aigle, cap à l', Coudres island, light.	501	Ange Gardien, l', lights.....	506
— — Murray bay, light.....	458	Annandale village, range lights.....	227
— ile à l', range lights.....	539	Anse, l', Coudres island.....	501
Airey, cape.....	360	Anticosti island.....	93
Aitkins point, shoal, buoy.....	223	— — channel north of, current..	53
Albany.....	532	— — — — — directions..	65
Alberton.....	243	— — climate.....	94
Albion mines.....	147	— — communication.....	95
Alchorn point.....	199	— — fisheries.....	94
Alcide rock.....	318, 321	— — general directions south of.	63
— — clearing marks.....	321	— — ice report.....	95
Aldouin river.....	184	— — lights.....	95
Alemek bay, village.....	272	— — lightvessel.....	64, 95
Alexander point.....	272	— — meteorological table.....	557
Algernon (South) rock, light.....	471	— — north coast.....	105
Algoma Mills.....	552	— — population.....	94
Allanburgh.....	550	— — productions.....	94
Alluvial hill.....	409	— — rivers.....	95
Alouette, batture de l'.....	456	— — soundings.....	97
— pointe à l'.....	456	— — south coast, current.....	49, 50
Alright island, cape, reef.....	84	— — to point de Monts, direc-	
Alston point.....	278	tions.....	67
American bank.....	296	Antigonish harbor, village.....	123
Amet isle, light.....	156	Antrobus point.....	357
— shoals.....	157	Appeetetat bay.....	381
— sound.....	156	Apple island.....	322
— — directions.....	160	Arctic current.....	49
— —, tides and tidal streams..	162	Argentaye point.....	486
Amherst fort.....	200	Arignole cape, reef.....	315
— — light.....	202	Arisaig point, light, village.....	143
— harbor.....	80, 87	Arnold bluff.....	301
— — tides.....	92	Arret, cap d'.....	498
— island.....	80, 86, 89	Arthabaska.....	525
— — light.....	89	Arthur, port.....	554
— village.....	87	Artimon bank.....	61

	Page.		Page.
Atlantic cove.....	75, 76	Basse bay.....	272
Audubon point, islets, rocks.....	371	Bathurst harbor, range lights.....	278
Augustin cove.....	209	— islet.....	278
Aulds creek.....	235	— town.....	268, 279
Aux Mouches river.....	352	Batiscan, range lights, village.....	520
Aylesbury cape.....	238	— river.....	519
Aylmer sound.....	357, 360	Battery point, Charlottetown.....	199
— — directions.....	361	— — Pictou.....	150
B.		— — Restigouche river.....	286
Bagot bluff light.....	99	Batture aux Loups Marin.....	435
Bagotville.....	433	— de l'île aux Lièvres.....	443
Bague isle light.....	538	— de l'île Blanche.....	440
— — channel.....	538	— des Islets.....	506
Baie bank, la, buoy.....	499	— Perron.....	521
— cape de la.....	499	— Francœur; lightbuoy.....	523
Bailey brook.....	143	— Simon, lightbuoy.....	517
Balache point, rock.....	116	Battures de l'Alouette.....	456
— — light.....	117	— — l'île aux Oies.....	472
Balance, cape.....	309	Bay city.....	552
Bald, cape.....	173	— Verte.....	169
Baleine point, Coudres island... 498,	500	— — directions, tides.....	170
Ballantyne cove.....	123	Bayfield island.....	121
Balsam lake.....	555	Beach point, Murray harbor.....	219
Banks point.....	227	Beacon Hill islet, Bonne Espérance	
Banquereau bank.....	60	bay.....	343
Bar light, Pictou.....	148	— — Little Natashkwan har-	
— reef, Saguenay river entrance.. 456		bor.....	378
Barachois de Mal baie.....	296	— — Watagheistic sound.....	364
— harbor, Amet sound.....	159	— point.....	207
Bare rocks.....	364	Bear bay, Anticosti; anchorage.....	107
Barnaby island.....	260	— cape; light, tides.....	190
— — lower St. Lawrence... 313,	314	— head, Anticosti.....	106
— road.....	315	— river.....	107
Barometer.....	47	— — tides.....	118
Barque cove.....	431	— hill, cape St. Lawrence.....	136
Barques, île du.....	529	— head.....	112
Barrett ledges lightbuoy.....	443	— — island, light, gut of Canso.. 112	
Barrier reefs, Five Leagues harbor... 341		— reef, gut of Canso.....	112
Barrio head.....	120	— — Prince Edward island.....	218
Bartibog island.....	255	Beaton point.....	231
— river.....	255, 256	Beaubère island.....	259
Basile, point à, lights.....	512	Beaufils, anse au.....	294
Basin, Amherst island.....	89	— bay.....	294
— head, Prince Edward island..... 230		Beauharnois canal.....	549
— island.....	336	Beaujeu, bank, lightbuoys.....	473
— Tatamagouche bay.....	159	— — light.....	474
— The, Bradore bay.....	336	— channel.....	474
— — Coacoachø bay.....	371, 372	— — directions.....	477
Bason river.....	399	Beaumont, reefs, lightbuoy.....	481
Basque, cape, road.....	457	— village.....	481
— harbor.....	86	Beauport bank.....	489
— island.....	322	— — village.....	488
— islands, Seven Islands bay..... 403		Becancour point, river, bend.....	522
		— range lights.....	522

	Page.		Page.
Becancour traverse.....	523, 524	Beurre, île au.....	539
Becket river.....	130	Bic channel, directions.....	318
Becscie river.....	95, 101	—— High land of.....	321
—— — telegraph station.....	102	—— island.....	316
Bedeque bay.....	210	—— — soundings off.....	320
—— harbor.....	210	—— — tides.....	319
—— — directions, tides.....	212	Bicoques islets.....	315
Bedford bay.....	234	Bicquette channel.....	317
Belfast pier.....	195	—— island.....	316
Bell, point, reef, Prince Edward is-		—— — light.....	317
land.....	192	Bienville village.....	482
—— river.....	99	Big cove.....	187
Belle isle.....	325	—— Dick rock.....	75
—— — lights.....	326	Bigot, island; lightbuoys.....	522
—— — strait.....	37, 325, 327	Billhook island.....	238
—— — — anchorages.....	332	—— — lights.....	239
—— — — current.....	48, 63	—— point.....	221
—— — — fogs.....	330	Birch channel.....	394
—— — — general directions....	331	—— islands.....	391
—— — — ice, icebergs.....	41, 330	—— point.....	266
—— — — landing, navigation..	331	—— — light, fog signal.....	267
—— — — meteorological table..	556	Bird rocks; light, fog signal.....	76, 77
—— — — soundings.....	328	—— — to Anticosti island, direc-	
—— — — tidal streams and cur-		tions.....	65
rents.....	53, 328	Bis islet.....	341
—— — — to St. Lawrence river,		Black bay, Belle Isle strait.....	332
directions.....	63	—— — lake Superior.....	554
—— — — winds.....	45	—— brook.....	255
Bellechasse island; light.....	480	—— islet, Kegashka bay.....	375
Belledune point.....	279	—— Joke cove.....	325
Bellefine river.....	486	—— Lands gully, fishing lights.....	187
Bellerive park lights.....	541	—— ledge, Watagheistic sound.....	364
Bellevue farm.....	198	—— point and rock, cape St. Law-	
Belles Amours bay, harbor.....	338, 339	rence.....	136
—— — point.....	337	—— — Cascapediac bay.....	288
Bellmouth curve lightbuoys.....	534	—— — Prince Edward island....	193
Belloni point.....	277	—— — west shore of gulf of St.	
Bergeman point.....	167	Lawrence.....	280
Bergeron coves.....	425	—— pond, Prince Edward island...	216
—— — tidal streams.....	426	—— reef, cape Airey.....	361
—— point.....	425	—— river, Cove Head bay.....	235
—— village.....	425	—— — Vin bay.....	254
Bernache point.....	272	—— rock point, Prince Edward	
Bersimis point.....	420, 422	island.....	190, 218
—— river.....	420, 421	Blackland point.....	246, 260, 262
—— — range lights.....	421	Blackville.....	260
Berthier, anse de.....	480	Blanc Sablon.....	332, 336
—— East point.....	479	Blanche, batture de l'île.....	440
—— tidal data.....	493	Blaskowitz point.....	400
—— trou de.....	479	Blockhouse point.....	199
—— village.....	479	—— — light.....	200
Betchewun harbor.....	383, 385	Blue, cape.....	120
Betts point, buoy.....	165	Bluff head, Great Mekattina island..	353
Betty point.....	144	—— peninsula.....	336

	Page.		Page.
Cailles, les.....	308	Caraquet shoal.....	274
Calumet river.....	411	— village.....	276
Cameron lake.....	555	Carcy, point à, wharf.....	494
Camille, mount.....	71, 312, 321	Cardigan bay.....	221
Campbell cove, Prince Edward island.....	232	— — northeast shore.....	227
Campbellton.....	287	— point.....	221, 222
— range lights.....	286	— — headland.....	222
Canada, climate, extent.....	27	— river.....	221, 222, 226
— communication.....	33	— shoal; buoys.....	222
— holidays, money, weights, meas- ures.....	36	Cardinal point.....	550
— lightvessels, buoyage.....	55	Caribou bay.....	272
— physical features and geology...	31	— channel, Nova Scotia; directions	155
— railroads.....	35	— cove.....	272
— standard time.....	36	— harbor.....	152
— storm signals.....	47	— — directions, tides.....	153
— telegraph.....	36	— island, Bonne Espérance bay.....	342, 343
Canal and lake vessels.....	547	— — Nova Scotia.....	152
Canals above Montreal; navigation season.....	547	— point, Gull island; light.....	153
— and channels above Montreal; lighting.....	547	— — north shore, St. Lawrence gulf.....	411
Canard river.....	456	— — Nova Scotia.....	145
Canoe cove.....	206	— — Shippegan harbor.....	272
Canseau point, spit.....	200	— reef.....	153
Canso bank.....	61	— river.....	152
— cape.....	61	— — range lights, Saguenay river.....	436
— gut of.....	37, 110	— West gully.....	152
— — — anchorages.....	113	Carillon canal.....	555
— — — caution.....	111	Carleton bay.....	284
— — — directions.....	117	— head.....	209
— — — ice.....	111	— mount.....	281, 287
— — — railway ferry.....	113	— mountain range.....	288
— — — tides and tidal streams	118	— road, village.....	287
Cantwell point.....	162	Carlisle point.....	269, 290
Cape Breton island; climate, coal, products.....	29, 30	Carouge.....	512
— — — meteorological table..	560	— point.....	488
— — — northwest coast..	129, 130	Carousel island; light.....	403
— — — physical features and geology.....	32	Carron point; lights.....	278
— — — west coast.....	125	Cascade point, rapids.....	548
— George headland.....	123	Cascapedia bay, river.....	288
— John peninsula.....	157	Cascumpeque bay.....	241
Capes, the.....	135	— harbor; lights.....	242
Caplin river.....	289	— — tides.....	139, 243
Capuchin cove.....	309	— narrows.....	241
Caraquet bank.....	276, 277	Cassie point; light, fog signal.....	179
— bay, range lights.....	275	Cat rocks.....	358
— channel.....	274	Catherine pond.....	126
— harbor.....	274	Caulfield point.....	162
— island; light.....	274	Caveau point; range lights.....	134
		— shoals.....	135
		Cavendish inlet.....	241
		Cawee islands.....	407

	Page.		Page.
Cawee ledge; rock.....	407	Cheticamp point light.....	134
Cedar rapids.....	548	Cheval point.....	250, 254
Center sand.....	505	Chevaux, île aux.....	482
Central reef.....	378	Chicago.....	553
Centre bank.....	328	Chicoutimi; channel, range lights...	435
— reef.....	362	— river.....	437
Chain island.....	343	— town.....	436
Chaleur bay.....	268, 281	— — tides.....	427
Chamber point.....	159	China point.....	195
Chambly basin, canal.....	532	Chippewa.....	550
Champlain canal.....	532	Church point.....	181
— lake.....	532	Citrouille point; light, lightbuoy....	521
— range lights.....	521, 522	Clark city.....	404
— village, point.....	521, 522	Claude river.....	302, 306
— — tides.....	510	— shoal.....	499
Chance harbor.....	145	Clear lake.....	555
Channel island.....	346	Clearwater point, shoals.....	386
— patch, lightbuoy.....	470	Cliff cape.....	166
— — tidal streams.....	476	— island.....	482, 483
Chapel pier.....	227	— islands.....	362
— rock, Lower St. Lawrence.....	472	Clifton.....	277
Charles, cape; range lights.....	518	Clorydorme point.....	302, 305
— — channel lightbuoy.....	518	— — range lights.....	305
— harbor, island, Mingan group....	385	Close islet.....	360
Charleton point.....	106	Cloudberry bay, point.....	373
Charlo river.....	281	Cluster point.....	359
Charlottetown.....	189, 204, 205	Coacoacho bay.....	371, 372
— harbor.....	199, 200	— river.....	372
— — buoys.....	201	Coal Mine cove.....	131
— — directions.....	203, 204	— places obtainable.....	59
— — tides.....	202	— point, Merigomish island.....	143
— meteorological table.....	559	Cobequid range.....	32
Charlow bank.....	229	Cocagne harbor; head.....	179
Charts, correction of.....	7	— island.....	181
— use of.....	9	— point.....	174
Chassé, point.....	403, 404	— river.....	180
— pointe à la.....	335	— — range lights.....	180
Chat (Chatte), cape.....	302, 308	Cochon island.....	524
— — light.....	308	Cochons, île aux, light.....	533
— river.....	308	Cock cove, Beau-fils bay.....	294
Chateau bay.....	327	— — Rimouski county.....	312
— Richer.....	506	— point, Rimouski county.....	312
Chatham.....	257	Cod bank, Natashkwan point.....	376
— coal, supplies.....	258	— — Ridge point.....	398
Chaudière river.....	511	Cody point.....	219
Chemung lake.....	555	Coffin island, Magdalen islands.....	82
Chêne bank.....	176	Colborne, port, lake Erie.....	550
— point.....	178	Cold Spring head; light.....	169
Chepstow point.....	231	Cole point.....	146
Cheticamp Eastern harbor; range		Collingwood.....	552
lights.....	134, 135	Collins shoal.....	383
— (Chetican) island.....	133	Colombier, cape.....	422
— point.....	133	Colquhoun point.....	144

	Page.		Page.
Dickensons landing.....	549	East point, Prince Edward island,	
Dickson islands.....	361	tides and tidal streams.	230
Diver island.....	349	—— — reef.....	231
Dixon point.....	181	—— river, Pictou.....	147
—— — range lights.....	182	—— rock, Bradore bay.....	337
—— rock.....	116	—— rocks, Boule bay.....	402
Docks in St. Lawrence gulf and river.	59	—— Saint rock.....	382
Doctor, island, point, reef, Caribou		Eastern bank, Hillsborough bay.....	198
harbor.....	151	—— maritime provinces of Canada..	27
—— spit.....	151	—— narrows, North Traverse, buoys.	503
Dog islands.....	346	—— passage, Amet sound, directions.	161
Dogs, cape.....	457	Éboulements, bay.....	461
Donax point.....	276	—— mount.....	454, 460
Doolan pond, anchorage off.....	113	—— village.....	461
Doucet	525	Échaufaud islet.....	457
Douglas island.....	282	Echemin river.....	490
Douglastown, Gaspé.....	297, 298	Ecureuils bank, les.....	514
—— Miramichi river, light.....	258	Eddy, cove.....	113
Douse point, range lights.....	195	—— point, light, fog signal.....	111
Doyle islands.....	360	—— spit, buoy.....	112
—— reef.....	82	Eden islands.....	357
Duchess point.....	201	Edmundston.....	448
Dukes island.....	351	Eel bay.....	284
Duluth.....	554	Egg island, English point... 409, 410,	411
Dunk river.....	210	—— — light.....	410
Dunn point.....	143	—— — Miramichi bay.....	252
Duns lake.....	123	—— rocks.....	351
Dunscomb rock.....	473	Eglinton cove and point.....	228
Durantaye point.....	481	Egmont bank.....	214
Dutchman point, rock.....	214	—— bay, cape, Prince Edward island	
Duthie point, light.....	289	light.....	214
Dyke island.....	356	—— — tides.....	215
E.		Eider islands.....	346
Eachren point.....	124	Elie, point à.....	84
Eagle cape, Anticosti; reefs	102	Elliot river.....	200
—— — Lower St. Lawrence.....	458	Ellis bay.....	102
—— harbor.....	352	—— — anchorage, directions	103
East cape, Anticosti.....	95	—— — beacons, range lights.....	102
—— — lightvessel	95	—— — supplies, tides.....	104
—— — to Table head; tidal streams.	109	Elm Tree point, light.....	280
—— — Saguenay river.....	433	Emerald junction.....	209
—— Caribou.....	152	Emersion point.....	125
—— channel, St. Geneviève harbor.	383	Emery, point, island.....	371
—— — Seven islands bay.....	404	—— rocks.....	372
—— — Magdalen islands.....	81	Enfer, cap à l'.....	292
—— lake.....	230	English bank.....	445
—— patch, Amet shoals.....	157	—— bay, Anticosti, anchorage, bea-	
—— point, Appeetetat bay.....	381	cons, lights.....	105
—— — Magdalen islands.....	81, 91	—— — Manikugan bay.....	417
—— — Pictou island.....	154	—— point, Egg island.....	409
—— — Prince Edward island,		Enmore river.....	215
light, fog signal.....	230	Enragée point.....	133, 135
		Enter island.....	349

	Page.		Page.
Entrance island.....	356	Fish islet.....	343
Entry island.....	84, 88	Fisherman ledge and channel.....	277
—— — light.....	88	Fishermans bank.....	218
Ephraim island.....	169, 171	Fishing point, light.....	167
Erie canal.....	532, 551	Fitzroy rock, light and whistling buoy.....	197
—— lake.....	547, 551	Five Leagues harbor.....	341
Escoumains harbor.....	425	—— — point.....	340
—— îles.....	424	Fixing position.....	15
—— river, range lights.....	425	Flaggs bay.....	549
Escuminac point, light, fog signal...	245	Flat island, Gaspé bay.....	296
—— reef, buoy.....	246	—— — light.....	297
—— river.....	188	—— — Great Mekattina island...	353
—— village.....	246	—— — St. Lawrence river.....	529
Eskimo bay.....	334, 345	—— islands channel.....	534
—— (Esquimaux) channel.....	345	Flat point, Cape Breton island.....	125
—— — island.....	387	—— river.....	194
—— — islands.....	333, 342	—— rocks.....	338
—— — — current off.....	49	Fleur river, la.....	487
—— harbor.....	387	Fleurant point.....	284, 285
—— island.....	345	Flower cove.....	333
—— point.....	387	—— ledges.....	328
—— — range lights.....	388	—— pot rock, cape Gaspé.....	298
—— — (town).....	388	Fly bank; lightbuoy.....	489
—— river (St. Paul).....	345	Fog bells, submarine.....	44
Espoir, cape, light.....	294	—— signals, general remarks.....	12
Esquamine islets.....	424	Fogs.....	42
—— — to Little Bergeron cove...	425	Foins, île aux.....	533
Etamamu river.....	366	—— — — lightbuoy.....	534
Étang du Nord.....	90	Force shoal.....	525
Éternité, cap l'.....	432	Forks buoy.....	165
—— cove, river.....	432	Fort point.....	433
Evans point.....	145	—— — de l'anse du.....	488
F.		—— rocks.....	346
Fair island.....	345	Forteau bay, anchorage.....	332
Fairway bank.....	328	Fortune bay and river.....	228
Falcon point.....	201	Foul rock.....	358
Fall river.....	399	Four fathoms ridge.....	398
Fame point light.....	304	—— rocks.....	348
—— — current off.....	50	Fox bay, Anticosti.....	94, 108
Farrans point canal.....	549	—— gully.....	246
—— — rapid.....	549	—— — Wallace harbor.....	166
Father point light.....	312	—— — Miramichi bay.....	247, 248
—— — lightbuoy.....	313	—— — lights.....	247
Femmes, descente des.....	433	—— islands, St. Lawrence gulf, north shore.....	352
Ferry point.....	200	—— point.....	108
Fifteen point, beacon.....	214	Francoeur, batture, lightbuoy.....	523
—— — church.....	213	Fraser farm, Pictou, lights.....	148
Fin rocks.....	357	Fraserville.....	447
Finlay point.....	131	Frechettes islands.....	512
Fish harbor, wood and water.....	353	French island and creek.....	184
—— island.....	238	—— river, Georgian bay.....	555
—— — range lights.....	239		

	Page.		Page.
French river, Merigomish harbor....	144	Ghost beach.....	111
—— — Miramichi bay.....	247, 252	Giddis point.....	181
—— — point.....	252	Giles, anse à, pier.....	467
—— — Prince Edward island.....	237	Gilmour cove and mill.....	257
—— village.....	247	Glacé bay.....	29
Frenchmans barn.....	143	Godbout (Goodbout) river.....	414, 415
Friar head.....	133	Goddard islet and rock.....	343
Frigate harbor.....	336	Goose cape, light.....	460
—— point.....	302, 305	—— — to cape Martin, anchorage, tidal streams.....	461
Fright channel.....	389	—— island.....	472
—— island.....	388	—— — meadows.....	472
Fullertons bar.....	286	—— — reef, spit.....	471
		—— lake light, signal station.....	269
G.		—— point.....	94, 98
Gaillard, la butte à.....	500	Gore islands.....	357
Galantry head.....	62	Gouffre, rivière du.....	498
Gales.....	46	Governor island, shoals.....	197
Gallia bay; range lights.....	529, 530	Grace, île de, range lights.....	531
Gallows point.....	196	Graham point, ledge, pond.....	220
Galops canal, point.....	550	Grand Entry harbor, light, buoys, di- rections, lagoon....	83
Garde point.....	285	—— — — tides.....	92
—— — lightvessel.....	286	—— Etang, light, Cape Breton island	133
—— rock.....	382	—— — lower St. Lawrence....	302, 305
Gascons, anse aux, light.....	292	—— islands.....	343
Gaspé basin.....	300	—— river, Chaleur bay; light.....	293
—— — tides.....	301	—— — Malpeque bay.....	238
—— bay.....	297	—— — settlement.....	241
—— — communication.....	268	—— Rustico harbor, lights.....	236
—— — northeastern shore.....	299	Grandance settlement.....	136
—— — southwestern shore.....	298	Grande Anse settlement.....	277
—— cape.....	298	—— Grève.....	299
—— — light.....	299	—— island, light.....	450
—— — current off.....	50	—— Matte river.....	306
—— harbor.....	299, 300	—— point, lightbuoy.....	499
—— peninsula; physical features ...	33	—— Vallée.....	302, 305
—— village, light.....	301	—— — range lights.....	305
Gaspereau river.....	169	Grandigue bank.....	179
Gaudin point, spit; buoy.....	223	—— point.....	174
General navigation.....	7	Grandon island, buoy.....	250
Genesee river.....	550	Grange rock.....	371
Gentilly, range lights.....	521	Grant beach, range lights.....	255
—— village, shoal.....	522	Grave point.....	221
George bay.....	119, 125	Gravois point.....	162
—— — tidal streams.....	124	Graystone wharf buoy.....	165
—— cape George bay.....	118, 119, 124	Great Bank of Newfoundland.....	62
—— — light.....	124	—— Basque island.....	403
Georgetown.....	225	—— Bergeron cove.....	425
—— harbor.....	221	—— Bird rock, light, fog signal.....	77
—— — anchorage, entrance, range lights.....	223	—— Boule island.....	402
—— — tides.....	225	—— Cawee island, cove, shoal.....	407
Georgeville.....	142	—— Chêne river.....	518
Georgian bay.....	552		

	Page.		Page.
Haystack island.....	482	Hulk rock.....	391
Heart shoal.....	170	Humes hill.....	219
Heath point; light, fog signal.....	96, 97	Hunter river.....	235
—— — reef.....	97	Hunting island.....	382
—— — tides and tidal streams, winds.....	98	Huntley rock.....	197
—— — meteorological table.....	557	Huron, lake.....	547, 551
Heffernan point.....	117, 125	—— port.....	551
Henry, cape, Anticosti.....	102, 107	Hydrographic Bulletins.....	9
—— island.....	119, 127		
—— — light.....	128	I.	
Heron channel.....	280	Ice, Cabot strait.....	39
—— island; light.....	280	—— Belle isle strait.....	41
—— rock.....	281	—— gulf of St. Lawrence.....	40
Herring cove.....	246	—— Lower St. Lawrence.....	41
—— point.....	269	—— signals respecting.....	42
Herriot isles.....	357	Illinois river.....	552
Hervey cove, point, and reef.....	230	Ilot point, beacon.....	429
Heu, pointe le.....	459	Indian head.....	210
High cliff point.....	106	—— island, Bedeque harbor.....	210
—— hill.....	142	—— (Bathurst) islet.....	278
—— land of Bic.....	321	—— point, bay Verte.....	169
—— — — Mekattina.....	332	—— — Buctouche.....	181
—— rock.....	88	—— — — range lights.....	182
Hillsborough bay.....	194	—— — Cascapediac bay.....	288
—— river.....	200, 233	—— — Pillage bay.....	383
Hird point pier.....	210	—— — Restigouche river.....	284
Hochelaga range lights.....	541	—— — Shippigan gully.....	265
Holland cove.....	113, 115	—— rocks.....	192
Hood, port.....	126	—— spit.....	210
—— — anchorage, directions.....	128	—— — light.....	211
—— — light.....	127	—— town.....	260
—— — tides.....	129	Information relating to navigational aids.....	7
—— — village.....	126	Inman rock.....	206
Hope river.....	237	Inner bar, Miramichi bay.....	248
Horseback bar, lightbuoys.....	518	—— Birch island.....	391
Horseshoe bar.....	248	—— islet, Napetepee bay.....	348
—— — buoys, lightvessel.....	249	Inverness village.....	132
—— shoal, Miramichi bay.....	248	Iron shoal.....	525
—— — buoy.....	249	Iroquois.....	549
—— shoals, Malpeque harbor.....	238	—— point aux.....	550
Horton point, shoal, spit.....	164	Island harbor.....	354
Hospital cape and rock.....	90	—— of Ledges.....	336
—— rock.....	472	—— shoal.....	210
Hospitals, marine.....	59	Isle Verte village.....	445
Hotteurs river.....	399	Islets, batture des.....	506
House harbor.....	85	Isthmus cove.....	340
—— island.....	344	—— point.....	127
Howe bay.....	228		
—— point.....	229	J.	
—— port.....	168	Jack, cape; shoal buoy.....	120
Huckleberry island, gully.....	246	—— shoal.....	117
Hudson river.....	532	Jackson point.....	170
Hughes point.....	186	Jacquet river.....	280

	Page.		Page.
James, cape Anticosti.....	107	La Boule point.....	430
— — Gaspé bay.....	299	La Butte Ronde.....	84
Jareux point.....	460	— Croix point.....	99
Jeremy island.....	422	— Grande baie.....	433
Jerome ledge.....	135	— Romaine.....	372, 373
Jerry island.....	163	— Table Roulante.....	295
Jib Sheet shoals.....	186	Lac, point du, range lights.....	525, 526
John bay.....	158	— — — tides.....	510
— cape.....	156	Lachance river.....	436
— river.....	158	Lachine canal.....	548
— — village.....	158	— rapids.....	547
Joli, mount.....	376	— town.....	548
— port.....	467	Lake island.....	367
Joseph point.....	107	— navigation.....	548
Jourimain, cape.....	172	Lalime (Lanim) point.....	286
— islands, light.....	172	Langlais point; light.....	518
— shoals.....	173	Lanoraie.....	533
Judique bank, clearing marks.....	125	Lapierre, île à.....	530
— shoal, buoy, clearing marks.....	125	Large channel.....	392
— village, pond.....	126	— island.....	391
Juniper point.....	227	— rocks.....	407
Jupiter river.....	95, 101	Lark harbor, island.....	325
Justaucorps.....	127	— islet.....	428, 456
— point.....	128	— — light.....	456
		— — reef.....	456
		— point.....	428, 456
K.		Launching bay.....	227
Kamouraska bay.....	451	Laurent shoal.....	169
— islands, village.....	450	Laurentian range.....	31
Kate point.....	127	Lauzon village.....	482
Kavanagh point, port Hawkesbury..	114	Laval bay, island.....	423
Keaton point.....	116	Lavaltrie island, range lights.....	533
Kegashka bay.....	374	Lazy bay.....	163
— point.....	374	L'Islet d'en haut.....	501
— — island.....	374	Le Trou, cape.....	90
— river.....	375	Leagues reef.....	341
Kenneth bank.....	193	Leander shoal.....	294
Kenogami lake.....	437	Leards range lights.....	207
Kettle rock.....	365	Ledge point, Belles Amours bay....	341
Kildare, cape.....	244	— — St. Geneviève harbor.....	383
— river.....	241	Ledges, island of.....	336
King head.....	143, 144	Legget shoal.....	257
Kingston.....	550	Lennox island.....	241
Knight point.....	229	Les Cailles.....	308
Knoll shoal, buoy.....	222	— Eboulements village.....	461
Kouchibouguac bay.....	186	— Mechins.....	302
— river.....	187, 188	Leslie cove.....	85, 86
Kouchibouguacis river.....	187	Levis dock.....	482
Kouchibouguet river.....	174	— point.....	482
		— — shoal.....	482
L.		— town.....	490
L'Abattis.....	499	Levrard, cape; lightbuoys.....	520
L'Anse à l'Eau.....	430	Lewis head.....	166
— à Louise.....	302	— reef.....	167
— au Foin village.....	434		

	Page.		Page.
Lièvres, batture de l'île aux.....	443	Lobster bay, Cawee islands.....	408
Lightvessels, riding lights, numbers.	55	—— ——— St. Lawrence gulf, north	
Light Lists, correction of.....	7	shore.....	347
Lights, exhibition of.....	54	Local magnetic disturbance.....	38
—— general remarks.....	11	—— ——— Shelldrake river.....	397
Limekiln bank.....	258	Logan point.....	146
Limestone creek.....	168	Loggieville (Black brook).....	255
Link islet.....	343	Long island.....	352
Linzee cape.....	125, 127	—— ledge.....	368
Lion island.....	343	—— Pilgrim island, light.....	449
L'Islet village.....	467	—— point Amet sound.....	159
—— tidal data.....	493	—— ——— Belle isle strait.....	332, 335
—— tides.....	476	—— ——— Cape Breton island.....	125
Lloyd's signal stations.....	58	—— ——— Lake Erie.....	551
Little Alemek bay.....	272	—— ——— Mingan channel.....	395
—— Basque island.....	403	—— river.....	376
—— Belledune point.....	279	—— Sault rapids.....	549
—— ——— light.....	280	—— spit, East point; clearing marks.	81
—— Bergeron cove.....	425	Longue île.....	482
—— Boule island.....	402	—— point lightbuoy.....	540
—— Cawee island.....	407	—— ——— traverse, range lights.....	540
—— Channel range lights.....	241	—— pointe, ledge.....	499
—— Dutchman rock.....	213	Longueuil lightbuoys.....	541
—— ——— point.....	210	—— shoal.....	541
—— Fish harbor; settlement.....	334	Loon rocks.....	373
—— Fox river.....	302	Lôtbinière range lights.....	517
—— Gaspé.....	299	Lou road.....	360
—— harbor, Nova Scotia.....	145	Loudon beach.....	146
—— Magdalen.....	302	Louisa harbor.....	361
—— Mal bay.....	460	Louiseville range lights.....	527
—— Matane river.....	309	Loup, anse à.....	332
—— Mekattina cove.....	358	—— bank.....	448
—— ——— island.....	332, 357	—— river.....	285
—— ——— river.....	357	—— rivière du, Lower St. Lawrence,	
—— Metis bay.....	310	light.....	447
—— ——— river.....	311	—— ——— ——— St. Peter lake.....	527
—— Natashkwan harbor.....	377, 378	—— ——— ——— tidal data.....	493
—— ——— light.....	378	—— ——— ——— town, point.....	447
—— ——— river.....	377	Loups Marin, batture aux.....	435
—— Pabou.....	293	Lovesick lake.....	555
—— river, Cascapediac bay.....	288	Low islet.....	383
—— ——— Howe bay.....	228	—— rocks.....	371
—— ——— Pomquet road.....	121	—— village.....	184
—— Rustico harbor.....	236	Lower Caraquet.....	274
—— sands.....	191	—— Neguac village; range lights.....	262
—— Shemogue river.....	173	—— St. Lawrence; current.....	50
—— Shippigan.....	270	—— ——— ice.....	41
—— Tracadie gully, light.....	263	—— ——— ——— pilotage rates.....	495
—— ——— harbor.....	120	—— ——— ——— pilots.....	60, 312
Livingston cove, Northumberland		—— ——— ——— quarantine.....	314
strait.....	142	—— ——— ——— tidal streams.....	53
Livingstone bay.....	222	—— Traverse; light.....	469

	Page.		Page.
Lower Traverse; tidal streams.....	476	Maisonneuve	543
Lump shoal.....	248, 249	Maitland flat.....	226
—— — buoy.....	249	—— point shoal.....	226
M.		—— port.....	550
Mabou cape.....	131	Major reef.....	361
—— high land.....	131	Mal baie.....	458
—— river.....	130	—— — river.....	458
—— — lights, tides.....	131	—— bay, light.....	296
Macdonald reef; buoy.....	146	Malcolm point.....	255
Macdougall point.....	193, 194	Malignant bay.....	142
Macfarlane point; range lights.....	164	Malpeque bay.....	238
MacInnis point.....	195	—— — range lights.....	238, 239
Mackay point, Cape Breton island..	126	—— harbor	238
Mackeen point.....	116	—— — anchorage, directions, tides	240
Mackinac strait.....	552	—— settlement	240
Mackenzie head, shoal.....	145	Man-of-war river.....	380
—— — Wallace harbor.....	163, 166	Manikuagan (Manicouagan) bay,	
Mackinnon, cape.....	360	point	417
Macnair point.....	115	—— hole.....	418
MacPhee shoal.....	226	—— peninsula	418
Macpherson point.....	473	—— point magnetic disturbance.....	38
—— — beacons.....	474	—— — telegraph and signal sta-	
Madagascar rock.....	117	tion.....	419
Madame island, Lower St. Lawrence.	482,	—— river	417, 418
	485	—— shoal; whistling buoy.....	419
—— — banks.....	485	Manitou point, river.....	399
—— reef; lightbuoy.....	485	Manowin island.....	403
Madden cove, point, anchorage.....	113	Maquereau point.....	269, 293
Madeleine cape, range lights....	523, 524	—— — light.....	293
—— — village.....	523	Marand rocks.....	488, 492
Magdalen, cape	302, 305	Marcelle point.....	272
—— — light.....	306	March water.....	240
—— islands	79	Margaree harbor.....	133
—— — communication, harbors,		—— river, range lights.....	132
inhabitants, seals.....	80	—— — tides.....	133
—— — directions, north coast....	91	Margaret island.....	482
—— — lagoon.....	83	—— tail, lightbuoy.....	483
—— — supplies.....	81	Marie île.....	536
—— — tides and tidal streams....	92	Marine hospitals.....	59
—— river.....	305, 306	Mark point.....	339
Magnetic variation.....	38	Marle head.....	206
Magpie bay.....	396	Marmen rock.....	444
—— — range lights.....	396	Marsh island.....	300
—— point.....	396	—— river.....	187
—— river.....	396	Martin cape.....	460
—— — to Trout river; coast, local		—— river.....	302, 307
magnetic disturbance.....	397	—— — light.....	307
—— village.....	396	—— shoal; clearing mark	112
Maguacha point, spit.....	281	Martinière point.....	482
Maheux, river	487	Matane.....	302
Maillard, cape.....	499	—— paps of.....	308
		—— river.....	309, 310

	Page.		Page.
Matane river lights.....	310	Middle island, Miramichi river; light	257
— village, St. Jerome de.....	310	— — St. Lawrence river.....	483
— — St. Ulric de.....	310	— islands, Watagheistic sound ap-	
Matapedia.....	268	proach.....	362
Maudit bank.....	328	— ledges, Belles Amours harbor...	339
Maurier, point au.....	365	— passage, Amet sound, direc-	
May islets.....	407	tions.....	161
McAuslin island.....	235	— patch, Bonne Espérance bay...	343
McCallums creek.....	235	— Pilgrim island.....	449
McConnell point.....	301	— point, Belles Amours harbor....	339
McDonald river.....	95	— reef, Mingan islands.....	391
McEacherns farm, lights.....	234	— — channel.....	392
McIsaac point, rock.....	123	— river, Bathurst harbor.....	278
McNairs cove.....	124	— — Pictou harbor.....	148
McWilliam cove.....	216	— rock Wood Pillar islet.....	470
Meadow island.....	300	— shoal Marmen rock.....	444
Meaford.....	552	— shoals, Pictou bank, buoy.....	155
Meat cove.....	76, 136	Midland.....	552
Medea rock; buoy.....	174	Mill creek, Cove Head bay.....	235
Mekattina, cape.....	355	— — Port Hood.....	117, 127
— harbor.....	354	— island.....	482
— high land of.....	354	Millbrook.....	152, 159
— island.....	354	Milles Vaches bay.....	424
— promontory.....	357	— — point, river.....	424
Melford point.....	112	— — tides.....	426
Melocheville.....	549	Milne bank.....	231
Merigomish harbor.....	143	— point.....	371
— — tides.....	144	— reef.....	371
— island.....	143	Milwaukee.....	553
— village.....	144	— bay.....	553
Mermot islet.....	346	Miminegash pond, range lights.....	217
Metabetshuan river.....	437	— reef.....	217
Meteorological tables.....	556-561	Mingan channel.....	394
Metis bay.....	311	— harbor.....	392, 393
— point, light.....	311	— island.....	393
— river.....	312	— islands.....	381
Meule cape, rocks, buoy.....	85	— — magnetic disturbance.....	38
Michaux, cape.....	309	— — soundings.....	395
Michigan, lake.....	547, 552	— — tidal streams.....	381
Middle bank, Nova Scotia banks....	61	— patch.....	394
— — St. Lawrence river.....	444	— river.....	392, 393
— bay.....	339	Miramichi bar.....	248
— channel, Lower St. Lawrence... 465		— bay.....	246
— — Seven Islands bay.....	404	— — directions.....	251
— ground, Charlottetown harbor.. 201		— bay, range lights.....	246, 247
— — Dalhousie harbor.....	282	— — lightvessel.....	249
— — Miramichi river.....	254	— — tides and tidal streams....	250
— — South Traverse channel;		— Inner bay.....	249
lightbuoy.....	469	— river.....	246, 255, 256
— — South Traverse channel;		Misaine bank.....	61
tidal streams.....	476	Miscou banks.....	267
— — Wallace harbor.....	165	— — tidal streams.....	268

	Page.		Page.
Miscou channel.....	270	Morts point aux.....	389
—— flat.....	270	Mosquito sands.....	227
—— gully, light.....	266	Mouche bank, la, light buoy.....	489
—— harbor.....	270	Moulin Baude anchorage.....	455
—— island.....	266	—— rivièrè du, range lights.....	436
Miscouche bank.....	211, 213	Mound island.....	364
—— church.....	213	Mount Louis bay.....	302, 306
—— point.....	213	—— ——— range lights.....	307
—— shoals.....	211	—— ——— river.....	306
—— — gas buoy.....	213	—— Stewart.....	225
Mistanoque bay.....	334, 349	Moutange island.....	390
—— harbor.....	349, 350	Mud point.....	183
—— island.....	349	Mulgrave, port.....	115
Mistassini (Great Stone).....	366	Mullegash point.....	160
—— reef.....	366	Mullin point, range lights.....	164
Mizzenette ledge.....	276	Murdoch point.....	254
—— point.....	274	—— shoal.....	146
—— sands.....	274	Murphy point.....	158
Moine, île du, range lights.....	529, 530	Murr islets, rocks.....	353
Moisie (Moisié) bay, point.....	400	Murray bay.....	458, 459
—— river.....	401	—— ——— light.....	459
—— rock, shoal.....	402	—— ——— village.....	459, 460
Molus river.....	184	—— canal, isthmus.....	550
Moncton.....	178	—— cove.....	113, 115
Money, Canadian.....	36	—— harbor, range lights.....	219
—— point.....	137	—— ——— tides, directions.....	220
Moniac island.....	390	—— head.....	218
Monk head.....	122	—— river.....	219
Montague river.....	223, 226	Mushkoniatawee bay.....	380
Montcalm rock.....	364	Muskwaro (Musquarro) point, river..	374
Montgomery island, light.....	282	Mushroul point.....	188
Montmorency falls.....	488	Mussel bank, Buctouche river.....	183
Montreal city.....	545, 546	—— ——— Restigouche river.....	286
—— ——— meteorological table.....	561	—— Bed buoy.....	252
—— harbor.....	543, 544	Muttock point.....	195
—— Ottawa, and Georgian bay canal.	555	Mutton island.....	354
—— ——— and Kingston, route.....	554	Mya point.....	271
—— to lake Superior, route.....	548		
Monts, point de.....	412, 413	N.	
—— ——— current.....	51	Nabisipi (Nabesippi) river.....	380
—— ——— general directions....	68	Nail head, pond.....	217
—— ——— light, fog signal.....	412	Napan bay.....	254
—— ——— tides and tidal streams		—— point.....	254
.....	51, 53, 54, 413	Napetepee bay.....	348
Moodie cove.....	147	Narrows buoy, Miramichi river.....	255
Moody point.....	255	Nash River bay.....	280
Morin shoal.....	444	Natashkwan cod banks.....	376
—— ——— light, whistling, and bell		—— (Natashquan) point.....	376
buoy.....	445	—— ——— to St. Geneviève island;	
Morrel river.....	233	coast, currents, tidal	
Morrisburg canal, town.....	549	streams.....	376, 377
Morrison beach.....	226	—— river.....	377
Morts île aux.....	456	Neguac gully; range lights.....	261

	Page.		Page.
Neguac sand bar.....	261	North cove, Belles Amours bay.....	338
Nelson town.....	258	— gully of Tracadie.....	263
Nepigon shoal lightbuoy.....	531	— — range lights.....	264
Neptune rock.....	502	— patch, Buchtouche outer bar...	181
Nest rock.....	367	— point, Anticosti, current.....	105
Netagamu islands, river.....	361	— — Miscou island.....	267
New Brunswick province; physical		— — Prince Edward island.....	217
features.....	32	— — light.....	218
— — products, trade, climate...	30	— reef, Egg island.....	409
— Glasgow town.....	150	— river, Bathurst harbor.....	278
— Carlisle town; light.....	290	— river, Caraquet bay.....	275
— Liverpool.....	490	— (Grand) Rustico harbor, lights..	236
New London harbor, range lights,		— Sydney.....	29
settlement.....	237	— Tracadie lagoon, river.....	263
— York.....	532	— Traverse, Lower St. Lawrence,	
Newcastle.....	258	tides.....	505
Newfoundland, south coast, currents	48	Northeast cape, East island.....	81
— west coast, current.....	49	— ledge, Belle isle.....	327
Newport, light.....	293	— point, light, St. Paul island....	75
— point.....	293	— Razade islet.....	322
Niagara river.....	37, 550	— reef, Bic island.....	316
Niapisca channel.....	389, 390	— — Egg island.....	410
— island, reefs.....	389	Northwest arm, Gaspé bay.....	300
Niche, la.....	432	— — Miramichi river.....	259
Nicholas point, semaphore.....	513	— — light.....	260
Nicolet range lights.....	525	— reef, Bicquette island.....	317
— river.....	525	— spit, Entry island.....	88
— traverse.....	525	Northport, range lights.....	242
— — lightbuoys.....	526	Northumberland strait, directions...	141
Niobe shoal.....	338	— — east shore.....	214
Nipigon bay.....	554	— — fogs, tides, tidal streams...	138
Nipisiguit bay.....	269	— — ice.....	40
— river.....	278	— — north shore.....	190
Nipissing lake.....	555	Norton shoal, point.....	278
Nob islet.....	358	Notices to Mariners.....	8
Noire point, lights, Saguenay river..	429	Notre Dame du Portage.....	448
— — Seven Islands bay.....	404	— — mountains.....	32, 33
— rivière.....	457	Nouvelle basin.....	287
Norman, cape, tides.....	329	— bay.....	284
North bank.....	183	— point.....	291
— beach, Percé bay.....	295	— river.....	287, 291
— Bird rock.....	77	Nova Scotia banks.....	60
— branch, Wallace harbor.....	163	— — north coast.....	142
— Canso light.....	117, 119	— — province, climate, prod-	
— cape, Cape Breton island, cur-		ucts, trade, fisheries..	29, 30
rents, light, tides.....	137	— — — physical features,	
— — Magdalen islands.....	91	geology.....	32
— — rocks.....	91		
— channel, Lower St. Lawrence,			
directions.....	462, 466, 498, 504		
— channel Lower St. Lawrence,			
tidal streams.....	463, 505		
— coast of Anticosti, current.....	105		

O.

Oak channel.....	250
— island.....	163
— — bar.....	163

	Page.		Page.
Oak point, range lights, Miramichi		Owen sound.....	552
bay.....	250	Oxley point.....	168
—— ——— Restigouche		Oyster island, buoy.....	165
river.....	286	—— pond.....	82
—— tree point.....	153		
Observation, cape.....	106	P.	
Ogden pond.....	123	Pacquet point.....	179
O'Hara point wharf; light.....	301	Pads, île du, range lights.....	533
Oies, battures de l'île aux.....	472	Paget bank.....	514
Oil river.....	95	Paint river.....	373
—— use of.....	23	Palmer point.....	162
Old Bic road and harbor.....	315	Palmers wharf light.....	207
—— Fort bay settlement.....	334, 346	Pandora point.....	270
—— ——— channel and island.....	346	Panmure head; light.....	220
—— gully of Tracadie.....	263	—— island.....	220
Old Harry cove.....	82	—— ledge.....	221
—— ——— head.....	82	—— shoal and spit, buoys.....	221
—— Horseshoe channel, range lights	247	Paradis point.....	419
—— Store point.....	219	Park point.....	112
—— Woman rock.....	298	Parsley, port.....	4457
Olding island.....	144	Partridge point.....	383
Olomanoshibo (Olomanosheebo)		—— mount.....	384
river.....	373	Pashashibu (Pashasheebo) bay.....	380
Onion island.....	473	Paspebiac bay, point, sandspit.....	290
Ontario, lake.....	37, 547, 550	—— ——— light.....	290
—— province, climate, products,		—— town.....	268, 290
trade.....	27-28	Paul bluff.....	207
—— ——— physical features, geology.	31	Pavillon, pointe au.....	507
Ore point.....	398	—— river.....	100
Orient point.....	422	Paynter islands.....	360
Orignal, bay, cape, reef.....	315	Peacock cove.....	173
Orignaux point, light.....	451	Peak point.....	339
—— ——— tidal data.....	493	—— ——— promontory.....	340
Orleans channel.....	466, 505	Pearl reef.....	84, 88
—— ——— lights.....	505	Pecten point.....	270
—— ——— directions.....	506	Penetanguishene.....	552
—— island.....	486	Peninsula point.....	158
Orwell bay.....	195	—— The, Gaspé.....	300
—— river.....	195	Pentecôte (Pentecost) river.....	409
Oswego river, city.....	550	Percé bay reef, rock, town, mountain.	295
Otonabee river.....	555	—— cape.....	89
Ottawa, city, canal, river.....	555	—— point.....	295
Otter river.....	95, 99	Percée rock.....	446, 447
Ouelle, rivière and point.....	452	Percival river.....	215
Outarde bay.....	420	Peril rock.....	348
—— point.....	420	Perron, batture.....	521
—— river.....	419	Perroquet bank, Belle isle strait.....	335
—— shoal, Lower St. Lawrence..	419, 420	—— ——— clearing marks.....	337
Outardes shoal.....	525	—— island.....	335
Outer Birch island.....	391	—— channel.....	394
—— islet, Wolf island; beacon.....	370	Perroquets islets; light.....	394
—— rocks, cape Mekattina.....	356	Peter point, Bathurst.....	278
—— Wapitagan islands.....	366	—— ——— Gaspé bay.....	296

	Page.		Page.
Petit Abattis.....	499	Platon point, lightbuoy.....	516
—— Debarquement.....	500	—— range lights.....	517
—— Rocher settlement; lights.....	280	—— ——— tides.....	510
Petitcodiac river.....	178	Pleasant bay, Cape Breton island....	136
Petite rivière parish.....	499	—— ——— Magdalen islands....	80, 84, 86
—— traverse, range lights.....	534	Pleureuse point, river.....	306
—— Vallée.....	302	Plongeur bay.....	422
Petites isles.....	433	Plum island, lightbuoy.....	536
Phelan point.....	210	Point à Carcy wharf.....	494
Philip bar.....	167	—— Levis shoal.....	482
—— port.....	168	—— Sèche.....	302
—— river.....	166, 168	Pointed rock.....	480
Piashti bay (Peashtebai).....	380	Pokemouche river, lagoon, gully, light.....	264
Pic, pointe au.....	458	—— village.....	265
Pictou bank.....	146, 155	Pokeshaw bay, settlement.....	277
—— bar.....	147	Pokesuedie island, shoal; light, fog signal.....	271
—— ——— light.....	148	—— point.....	273
—— custom-house, light.....	148	Pomquet banks, harbor; tides.....	122
—— harbor.....	145, 147	—— island, light.....	121
—— ——— coal, communication, sup- plies.....	151	—— point, river.....	122
—— ——— directions, tides.....	149	—— road; anchorage, directions.....	122
—— ——— lights.....	148	Pond point.....	339
—— island.....	146, 153	Poplar island bridge.....	200
—— ——— lights.....	154	Porcupine, cape.....	111
—— landing.....	150	—— ——— tidal stream.....	118
—— road, directions.....	146	Porpoise rocks.....	347
—— town.....	150	Port Hill settlement.....	241
Pierre de Gros cap.....	91	—— Howe settlement.....	168
—— river.....	306	—— Huron.....	551
Pigeon islet.....	337	—— Joli shoal; lightbuoy.....	470
—— lake.....	555	—— Philip settlement.....	168
Pilgrim islands.....	449	—— Selkirk wharf.....	196
—— shoal.....	448	Portage bay.....	355
—— ——— light and bell buoy.....	449	—— harbor.....	355
Pillage bay.....	382	—— island, light.....	248
Pillar point.....	292	—— ——— channel.....	249
Pillars islets.....	470	—— ——— ——— range lights.....	247
—— ——— tides, tidal streams.....	476	—— la butte de.....	91
Pillet, cape; church.....	173	Portneuf, St. Lawrence lower river..	423
Pilot charts.....	9	—— magnetic disturbance.....	38
Piloting.....	19	—— river, light.....	423
Pilots for Lower St. Lawrence.....	60	—— sands.....	424
Pinette harbor.....	194	—— village.....	516
—— point.....	193	—— ——— range lights.....	517
—— shoals.....	194	Portsmouth point.....	126
Pins, point aux.....	473	—— shoal.....	128
Pinware bay.....	332	Poste St. Martin range lights.....	435
Pirate cove, island.....	114	Potato river.....	95
—— point.....	113	Pouillier à Gagnon lightbuoy.....	541
Pizeau point.....	489	—— Carpentier cutting.....	521
Plaister cove.....	115	—— ——— lightbuoy.....	522
Plateau island.....	296		

	Page.		Page.
Pouillier Grandmont cutting.....	521	Quebec city.....	490
Powell point.....	146	—— communication, hospitals,	
Pownell bay.....	197	supplies.....	496
—— peninsula.....	197	—— meteorological table.....	558
Prairie bay, light.....	501	—— time signal, weather.....	497
—— tides, directions.....	502	—— harbor.....	488
—— point.....	501	—— anchorage, directions.....	491
—— shoal.....	501	—— docks.....	494
Premier shoal.....	114	—— ice, pilotage, tugs.....	495
Presqu'île.....	135	—— lights.....	490
Preston beach, range lights.....	246	—— tides.....	492, 493, 507, 510
Price island.....	358	—— to Montreal; current, tidal	
Priest point.....	183	streams.....	510, 511
Prim island.....	195	—— to Montreal.....	508-511
—— point, light.....	194	—— province; products, trade, cli-	
—— peninsula.....	194	mate.....	28
—— reefs.....	195	—— physical features, geol-	
Prince Edward island, east coast....	218	ogy.....	31, 33
—— province, products,		Quetachu Manikuagan (Quetachoo	
trade, climate.....	30,	Manicouagan) bay.....	380
31, 189		Quin channel.....	389
—— physical features, ge-		—— island, reef.....	388
ology.....	33	Quinte, bay of.....	550
—— north coast.....	231		
—— south coast.....	190		
—— west coast.....	216		
—— shoal, light vessel.....	455, 456		
Princess Louise basin.....	493		
—— light.....	490		
—— marine tower.....	489		
—— dock.....	494		
—— embankment, lights.....	490		
Prinsta bay.....	107		
Provencher shoal.....	524		
Prunes, île aux.....	536		
Puffin bay.....	385		
Pugwash bay, point, reef.....	166		
—— harbor, road, light.....	167		
—— tides.....	168		
—— river.....	168		
—— village, junction.....	168		

Q.

Quarantine anchorages, establish-	
ment, Grosse île.....	484
—— Lower St. Lawrence.....	314
—— pass.....	484
—— Rimouski.....	484
Quarry channel.....	391
—— cove, island.....	390
—— head, point.....	121
Quart point.....	253

R.

Race island.....	482
Raft gully.....	263
Rag ledge.....	358
Ragg bay and point.....	385
Ragged point.....	127
Raisins, île aux; range lights.....	528
Rambler cove.....	396
Rapide Plat canal.....	549
Razade islets.....	322
Reaux island.....	482
Red bay, Belle île strait.....	332
—— cape.....	86
—— head, Egmont bay.....	214
—— island, Bonne Espérance	
bay.....	343
—— islet, Lower St. Lawrence, light.	439
—— bank, light vessel.....	439, 440
—— reef, clearing marks.....	323
—— point, Chaleur bay.....	289
—— north shore of gulf.....	353
Reddish point.....	292
Reef point, Anticosti.....	108
—— Nova Scotia.....	157
Reid point.....	220
Renouard point.....	179
Repairs; places where effected.....	59
Repentigny range lights.....	538

	Page.		Page.
Saint Anne mountains.....	307, 308	Saint Johns.....	532
—— point.....	308	—— Joseph bank.....	461
—— river.....	307	—— cape.....	461, 462
—— Antoine.....	302	—— light.....	461
—— point.....	514	—— isle.....	539
—— lightbuoy.....	515	—— Laurent cape.....	169
—— range lights.....	514	—— village, light.....	487
—— Augustin bar.....	513	—— tidal data.....	493
—— shoal lightbuoy.....	513	—— Lawrence bay, cape, lights....	136
—— Augustine chain of islets.....	352	—— estuary, directions down..	72
—— cove.....	414	—— south shore.....	302
—— harbor.....	334, 352	—— gulf.....	37
—— port, river.....	352	—— currents.....	50
—— Barthelemi isle.....	432	—— fogs, fog signals.....	42
—— Catherine bay.....	429	—— ice.....	38, 40
—— Charles junction.....	448	—— north shore.....	332-334
—— point, Moisie bay.....	400	—— and river, barometer.	47
—— reef.....	400	—— deviation,	
—— river, Quebec.....	489	local mag-	
—— Clair lake, river.....	551	netic dis-	
—— Croix bar; lightbuoy, range lights	515	turbance,	
—— light.....	516	magnetic	
—— village.....	515	variation.	38
—— Étienne bay, river, village....	432	—— gales.....	46
—— Félicité, fog signal.....	309	—— general di-	
—— Fidèle village.....	458	rections..	62
—— Flavie.....	448	—— marine signal	
—— Francis lake, river.....	549	stations...	57
—— port, lights.....	525	—— navigation ..	37
—— river lights.....	528	—— storm signals.	47
—— François parish, lights.....	486	—— submarine fog	
—— Fulgence village.....	434	bells.....	44
—— Geneviève island.....	382	—— tidal streams	52, 53
—— indraft.....	377	—— tides.....	51
—— harbor.....	383	—— winds and	
—— mount.....	382	weather...	44
—— George cove.....	299	—— wireless tele-	
—— Giles point.....	414, 417	graph sta-	
—— Hyacinthe.....	532	tions.....	58
—— Ignace cape, village.....	468	—— Lower, pilots.....	312
—— île.....	529	—— tidal data.....	53
—— Irénée village, light.....	460	—— river system.....	37
—— Jacques river, church.....	215	—— Green island to the	
—— Jean, anse.....	432	northeastern en-	
—— bay, river, light.....	432	trance of South	
—— point.....	488	Traverse directions.	453
—— Port Joli village.....	467	—— ice.....	41
—— tidal data.....	493	—— navigation above	
—— village; light.....	487	Montreal.....	547
—— Jerome de Matane.....	310	—— Quebec to Mon-	
—— John lake.....	437	treal.....	508, 509
—— mount.....	381, 396	—— to Belle isle strait,	
—— river, Gaspé bay.....	298	directions.....	64
—— north shore of gulf.	395, 396	—— Cabot strait, direc-	
		tions.....	63

	Page.		Page.
Saint Louis isle.....	432	Saint island parish.....	490
—— lake.....	548	—— shoals.....	469, 470
—— rapids.....	548	—— anchorage.....	479
—— river.....	37	—— Romuald.....	490
—— village.....	188	—— Sauveur.....	490
—— Margaret bay, point, river.....	406	—— Simeon village, light.....	457
—— point to Great Cawee		—— Thomas bank.....	468, 475
island, coast.....	406	—— lightbuoy.....	475
—— Martin river, range lights.....	435	—— de Montmagny village....	468
—— Mary bay.....	222	—— pier, point, range lights	468, 479
—— cliffs.....	101	—— village.....	467
—— islands.....	362	—— Ulrich de Matane.....	310
—— rapid.....	541	—— Vallier bank.....	481
—— reefs.....	363	—— point, village.....	480
—— Marys river, rapids, falls canal.	553	Sainte Anne de Beaupré, tides.....	507
—— Maurice river.....	524	—— tidal data.....	493
—— Michael, cape, lightbuoy.....	538	—— la Pocatière village..	452
—— Michel point, village.....	481	—— pointe au Péré	
—— Nicholas, cape.....	417	village.....	312
—— harbor.....	415, 416	—— Sorel range lights.....	530
—— tides.....	510	—— des Monts village.....	302
—— river.....	184	—— du Saguenay.....	437
—— Ours, île.....	533, 534	—— mont.....	452
—— lightbuoy.....	534	—— river.....	506
—— lock.....	532	—— shoals, lower.....	452, 453
—— traverse range lights.....	534	—— upper.....	520
—— Pancras cove, point.....	417	—— river.....	520
—— Patrick hole, river.....	487	—— Annes lock.....	555
—— Paul, bay.....	498	—— Claire.....	95
—— tidal data.....	493	—— Emilie range lights.....	519
—— island.....	74-77, 137	—— Famille range lights.....	505
—— lights.....	75	—— Félicité.....	302
—— to Bird rocks and Magdalen		—— Thérèse ile range lights.	537, 538, 539
islands, directions.....	64	Saints channel.....	383
—— river.....	345	—— directions.....	384
—— Peter bay, Cape Breton island .	29	—— rocks.....	382
—— harbor (bay).....	232	Salmon bay, islet.....	342
—— range lights.....	233	—— cape, port, light.....	458
—— lake.....	525	—— (Belloni) point.....	277, 278
—— range lights.....	527	—— light.....	278
—— river.....	233	—— river, Anticosti.....	95
—— town.....	233	—— Cape Breton island.....	130
—— Peters island, light.....	198	Salt Lake bay.....	95, 100
—— shoals, buoy.....	199	Salutation point.....	209
—— spit and road.....	199	Sand Lark reef.....	390
—— Petronille, light.....	488	Sandbury cove.....	213
—— Pierre bank.....	60	Sandtop cape.....	109
—— des Becquets point, lights.	520	Sandy bay.....	335
—— et St. Paul village.....	498	—— beach.....	299
—— island.....	62	—— point, light.....	300
—— point, lights.....	505	—— harbor, island.....	351
—— Roch des Aulnaies (Aulnets)		—— Hook.....	86
village.....	452	—— channel.....	87
—— height of tide.....	475, 507	—— flat.....	86

	Page.		Page.
Sandy Hook shoal.....	87	Shag islet.....	379
— Island, range lights.....	242	— rock, Meat cove.....	136
— point, Caraquet island.....	275	Shallop channel.....	344
— — Mingan harbor.....	393	— cove.....	340
— — Seven Islands bay.....	403	— creek.....	95, 100
— river.....	398	— river.....	95, 398
Sapin point, ledge, settlement, light.	188	— rock.....	230
Sarnia town.....	551	Shea, point, pier.....	87
Sault au Cochon.....	499	Shediak bay.....	174
— — — rocher de.....	502	— harbor.....	175
— pass.....	511	— — range lights.....	176
— Ste. Marie canal, towns.....	553	— — tides, directions.....	177
— The, lights.....	512	— island.....	174
Saut de Mouton.....	424	— — North channel, range lights	175
Savage harbor.....	233	— — range lights.....	175
— — range lights.....	234	— point.....	179
— island.....	242	— river, village.....	178, 179
— point.....	144	Shekatika bay, wood.....	350
Savards range lights.....	435	— (Shecatika) island.....	349
Sawbill river.....	398	Sheldrake island, range lights.....	254
Scale rock.....	357	— point, river.....	398
Scaumenac mount.....	281	— river, magnetic disturbance....	397
— point.....	286	— shoals.....	255
Scie, rivière de la.....	490	Shemogue river.....	173
Scollop patch.....	276	Shettle, port.....	457
Scoudouc river.....	178	Shickshoc mountains.....	33, 307
Sea Cow channel.....	387	Shilelah cove.....	259
— — head, light.....	209	Ship bar.....	161
— — island.....	386	— channel, Malpeque bay.....	238
— Trout point.....	197, 199	— — Wallace harbor.....	163
— Wolf island, light.....	132	— flat, Shippigan flat, buoy.....	271
Seal bank.....	179	— point.....	112
— house cove.....	400	— rock, buoy, clearing mark.....	112
— islands, Lower St. Lawrence....	470	Shippigan channel, buoys.....	273
— islets.....	365	— flat.....	271
— net point.....	364, 365	— gully, lights, fog signal.....	265
— point.....	353	— — point.....	272
— river.....	195	— harbor.....	265, 272
— rock.....	299	— — directions, tidal streams...	273
— rocks, Belle Isle strait.....	355	— island.....	266
— — Doctor point.....	151	— shoals.....	273
Semaphore signals at point Nicholas		— (Shippegan) sound.....	271
and Cape á la Roche.....	513	— village and church.....	272
Seminaire spit.....	506	Ships Head rock.....	298
— The.....	479	Shoal cove.....	385
Serpent point, reef.....	304	Shockpish river.....	183
Seven islands.....	402	Sight point.....	131
— — bay.....	403, 404	Signal stations, marine.....	57
— — — directions, tides.....	405	Signals respecting ice.....	42
— — — winds.....	406	Simcoe lake.....	555
— — — magnetic disturbance.	38	Simms point.....	238
Severn river.....	555	Simon inlet.....	272
Shag island and rock, Shekatika bay.	351	Single rock.....	357
— — Magdalen islands.....	84	— Tree point.....	291

	Page.		Page.
Skait point.....	273	Southwest river.....	237
Skinner reef, buoy.....	152	—— point; Anticosti.....	100
Slime rock.....	367	—— ——— anchorage, tides.....	101
Smith island.....	126, 127	—— ——— light.....	100
—— point, Northumberland strait...	166	—— ——— St. Paul island.....	75
—— ——— port Hood.....	127	Spear, cape.....	169
—— ——— Prince Edward island.....	220	—— shoal.....	170
Snake point.....	174, 175	Spectacle reef.....	551
Solander point.....	227	Sphinx rock.....	378
Soldats, pointe aux.....	531	Spit island.....	345
Sorel town.....	531	—— point.....	254
Sottise, île à.....	482	—— shoal.....	248, 249
Soulanges canal.....	547, 548	—— ——— buoy.....	249
Souris harbor; lights.....	229	Spithead, port Hood.....	126
—— head.....	228, 229	—— shoal, Hillsborough bay; buoy...	199
—— village.....	229	Spray reef.....	360
South beach, Percé bay.....	295	Springhill.....	29, 448
—— branch, Wallace harbor.....	163	Sproule point.....	408
—— breaker.....	371	Spry point.....	227
—— cape, Amherst island, light.....	89	Square channel.....	352
—— channel, Lower St. Lawrence		Squaw bay.....	197
	453, 465	—— shoal.....	198
—— ——— Lower St. Lawrence, above		Squirrel pond, mount.....	133
Crane island.....	479, 482	Staff island.....	358
—— ——— Lower St. Lawrence, above		Standard time.....	36
Ouelle point.....	465	Stanhope, cape.....	235
—— ——— Lower St. Lawrence, South		Stanley river.....	237
Traverse to Crane island.	467	Star island.....	345
—— ——— Lower St. Lawrence, tidal		Stewart point.....	193
streams.....	463	Stone island, Bonne Espérance bay ..	345
—— Makers ledge.....	366	—— ——— St. Lawrence river.....	529
—— point, Anticosti.....	99	—— Pillar islet; light.....	471
—— ——— Five Leagues harbor.....	341	Stonehaven, light.....	277
—— river, Caraquet bay.....	275	Stony lake.....	555
—— ——— settlement.....	219	—— point, Belles Amours harbor ...	338
—— rock; light.....	471	Storm signals.....	47
—— (Little) Rustico harbor.....	236	Sturgeon bay.....	222
—— ——— Tracadie gully; light.....	263	—— lake.....	555
—— Tracadie river.....	263	—— river.....	222
—— Traverse channel.....	469	Submarine fog bells.....	44
—— ——— anchorages.....	478	Sud, rivière du; lower St. Lawrence..	468
—— ——— directions.....	477	Sugarloaf hill, Malignant bay.....	142
—— ——— Middle ground lightbuoy.	469	—— ——— Restigouche river.....	284, 285
—— ——— tidal streams.....	476	Summerside pier; lights.....	211
Southeast reef, Bic island.....	316	—— town.....	212, 213
Southwest arm, Gaspé bay.....	298, 300	Superior, lake.....	37, 547, 553
—— ——— Miramichi river.....	259	Surveyor pond.....	232
—— ——— Cape Breton island.....	130	Susan cape, creek.....	126
—— breaker.....	371	Swanton point.....	228
—— cape, Amherst island.....	89	Swashway, Miramichi bay.....	249
—— islands.....	363	—— ——— ——— buoy.....	249
—— ledge.....	342	—— ——— ——— range lights.....	247
—— Razade islet.....	322	Sydney.....	29
		—— meteorological table.....	560

T.

	Page.		Page.
Table head and hill, Anticosti.....	108	Toronto, city.....	27, 550
— roulante, la.....	295	Tortue river.....	399
Tabusintac gully, lagoon, and river..	262	Tourmente, cape.....	504
Tadoussac (Tadousac) harbor.....	429	Tower point.....	107
— village.....	430	— rock.....	88
— harbor; tides.....	427, 428, 507	Tracadie harbor, George bay; tides, village.....	120, 121
Tail islet.....	343	— — Prince Edward island; range lights.....	234
— rocks.....	357	— lagoon.....	263
Talbot river.....	555	— village.....	264
Tatamagouche bay.....	159	— river.....	121
— — anchorage, tides.....	160	Tracadigash point, lights.....	287
— river.....	160	— sandspit.....	288
Taureau shoal.....	524	Traverse bar.....	286
Telegraph cables.....	59	— cape.....	171, 209
— wireless.....	58	— cove; iceboats.....	209
Tender reef.....	363	— spit.....	503
Tent island.....	345	— — buoy.....	506
Terras point.....	218, 220	Treble Hill island.....	353
Terres Rompues rapid.....	437	— islet.....	373
Tertiary Shell bay.....	371, 372	Treen bluff.....	157, 162
Tetagouche river.....	278	— reef.....	165
Three Rivers harbor.....	221	Trembles, point aux, bend, lightbuoy	539
— — — tides.....	510	— — — curve lightbuoy.....	540
— — shoal.....	524	— shoal; lightbuoy.....	514
— — town.....	524	Trent canal.....	555
— — rocks, St. Nicolas harbor...	416	— river.....	550, 555
— — Shekatika bay.....	351	Trenton.....	555
— tides, anchorage.....	200	Trilobite bay.....	385, 386
Thrumcap islet, spit.....	222	Trinité, cap à la.....	432
Thunder bay.....	554	Trinity bay.....	412
— point.....	398	— cove.....	74, 75
— river.....	398	— river.....	412
Tickle inlet, Mal bay; light.....	296	Trois Pistoles village, light.....	322
Tidal streams; Belle Isle strait.....	53	— Saumons river.....	467
— — gulf and river St. Lawrence.	52, 53	Trou, cape le.....	90
— — Northumberland strait.....	138	— de Berthier.....	479
Tide tables.....	8, 52	Trout river.....	400
Tides, general remarks.....	12	— rock.....	199
— gulf and river St. Lawrence....	51	Truro.....	148
— Northumberland strait.....	138	Tryon, cape; light.....	238
Tidnish head.....	170	— head.....	208, 209
— river.....	169	— river.....	209
Tignish river, harbor; village, lights.	244	— shoals.....	208
Tooker bank.....	327	— — whistling buoy.....	209
Tormentine, cape.....	171	Tupper, point; light.....	113
— — range lights.....	172	Turbalton bay, anchorage.....	118
— reefs.....	170	Turner, cape.....	236
— — bell buoy, directions, tidal streams.....	171	Two Heads island.....	484, 503

U.

	Page.
Upper Caraquet.....	274, 276
— Neguac village.....	261
— sound.....	364
— Traverse; light, lightbuoy.....	469
— — tidal streams, turn of.....	476

V.

Vaches, île aux; traverse range lights.....	539
— patch.....	455
— point.....	428, 454
— — reef.....	455
— — — tidal streams.....	428
Valin river, range lights.....	435
Valley cove.....	325, 326
Valleyfield.....	549
Varennés curve lightbuoys.....	539
— village.....	539
Variation, magnetic.....	97
Vases, rivière des.....	446
Vaureal river.....	95
Venus cove.....	115
Verchères lightbuoy.....	536
— point.....	536
— traverse, range lights.....	536
— village range lights.....	536
Vernon river.....	195
Verte bay.....	169
— île.....	335
— point, Mal bay.....	296
— — trou de Berthier.....	479
Victoria bridge.....	543
— village.....	207
Vin bay.....	253
— harbor.....	252
— island; range lights.....	252
— river.....	253
— spit and shoal.....	252
Vincent cape.....	550

W.

Wacouta rock.....	392
Wallace channel.....	163
— harbor.....	162
— — anchorage, directions.....	165
— — buoys.....	164
— — lights.....	164
— — tides.....	166
— river.....	162
— village.....	163
Walrus channel.....	387
— island.....	386

Page.

Wapitagan harbor.....	366, 367
— island.....	366
Warren cove.....	200
— Farm range lights.....	201
Washatnagunashka bay.....	380
Washball rock, Amet sound.....	160
Washikuti (Washchecootai) bay;	
rocks.....	373
Washtawooka bay.....	379
Watagheistic island.....	363
— sound.....	363
— — directions.....	364, 365
Watch rock, Bonne Espérance bay... ..	344
— — Hare harbor.....	358
Watshishu (Watcheesho) peninsula..	380
Waugh shoal.....	157
Weather forecasts.....	48
Welland canal, river, town.....	550
West bay, Anticosti.....	98
— cape, Amherst island.....	89, 90
— — Saguenay river.....	433
— Caribou.....	152
— channel, Bonne Espérance bay.....	345
— — Seven Islands bay.....	405
— cliff.....	94, 106
— — to Table head; tidal streams.....	107
— cove, Middle bay.....	340
— grounds.....	316
— gully, Caribou harbor.....	152
— — Malpeque harbor.....	238
— lake.....	90
— Narrows, Beaujeu channel tides.....	476
— — passage, Beaujeu channel..	474
— point, Anticosti; light.....	104
— — — to North point; cur-	
rent.....	105
— — Chaleur bay.....	291
— — light.....	292
— — Orleans island.....	488
— — Pictou island; light.....	154
— — Prince Edward island;	
light.....	215
— — — — — tides, tidal	
streams..	139;
	216
— reef, Prince Edward island,	
whistling buoy.....	216
— river, Pictou.....	148
— rocks, Seven islands.....	403
— Saint rock.....	382
— Sand.....	503
— — passage.....	505

	Page.		Page.
Walrus spit, Prince Edward island...	215	Winds, weather.....	44
Westaways Farm light.....	223	Windsor town.....	551
Western bank, Charlottetown harbor.	199	Winter creek.....	234, 235
— lightvessel, lake St. Peter.....	527	— portage.....	246
— narrows, North Traverse.....	503	Wireless telegraph stations.....	58
— passage, Amet sound, directions.	161	Wolf bay and island, cape Whittle..	370
Whale channel.....	345	— island, Magdalen islands.....	91
— head.....	357	Wolfe cape.....	216
— island, Eskimo islands; beacon.	342	— cove.....	491, 495
— — Mingan group.....	385	— river.....	215
— patch and reef.....	342	Wood island, Hunting island.....	382
Wharf range Crapaud road.....	207	— — Prince Edward island;	
Wheatley river.....	235	lights.....	191
Wheeler bar.....	221, 225	— — channel.....	194
Whelp rock.....	343	— islet, Fish harbor.....	353
White cliff.....	102	— Pillar islet.....	470
— head Percé bay light.....	295	Wreck bay, West bay, Anticosti....	96
— Horse reef.....	90	— cove.....	137
— islet.....	440	— marking vessel, lights.....	57
— — reef; lightvessel.....	440, 441	— point.....	98, 108
— point, port Daniel, light.....	292	Wright bank.....	259
— sands settlement.....	191	Wrights range lights.....	207
Whittle, cape.....	332, 370	Wye rock.....	479
— — to Natashkwan point, navi-			
gation, tidal streams, etc.	369		
— rocks.....	370		
Widow point.....	151, 152		
Wild fowl reef.....	423		
Williamsburg canals.....	550		
Wilmot river.....	210		
Wilson bank, point.....	266		
Windmill Point basin.....	543		

Y.

Yacta point.....	284
Yamachiche bend lightbuoy.....	526
— point.....	526
York river.....	200

Z.

Zephyr rock, lightbuoy, buoys.....	174
------------------------------------	-----

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